Classification of Flat-worked Potsherds and Flat-worked Stones Used as Play Objects: A Study of Dimensions

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Abstract: *Frequently overlooked as a ubiquitous but still insignificant artefact by archaeological researchers in India, flat, grounded, or worked potsherds and worked stones were manufactured from readily available materials, often from broken ceramic vessels or fragments of stones. These flat-ground or worked discs, generally called "discs" or "hopscotch," were frequently mixed up with sherds without considering that they were consistently produced for particular purposes and prevalence. Although the function or usage of this artefact assemblage in Vadnagar was elusive, the primary aim of this paper was to determine the regularity of different shapes by assessing the morphology, with an anticipation that some concept of function would be forthcoming. Secondly, by studying in detail the different dimensions i.e. diameter and thickness of each artefact, the focus lay on justifying the artefact used for playing the game of Hopscotch and Seven Stone. These parameters are supported by comparative archaeological and contemporary data from Indian and foreign sites. Classifying these flat-worked potsherds and flat-worked stones by comparing their dimensions helped us understand how this artefact assemblage was utilized in games and valued by the people of Vadnagar.*

Keywords: Flat-worked Potsherds, Flat-worked Stones, Classification, Function, Hopscotch, Seven Stones, Vadnagar

Introduction

Flat-worked potsherds and flat-worked stones that have been ground or transformed are reported in abundance at archaeological sites in India. The common origin of these artefacts does not reflect their importance in the lives of Indians but their more or less universal distribution in time and space has been noticed. As their function was elusive, they were often grouped with pottery sherds and stone discs.

In the Indian context, Ghosh (1989:179) gives a probability for these artefacts stating, "Flat potsherds with edges ground to a round shape, or similarly shapes discs of stones or bone, found at many sites, were probably the ancient counterpart of hopscotches – a children's game of hopping on one foot and pushing the flat object over scotches (lines) marked on the ground". He lists several archaeological sites that belong to Harappan

contexts, sites with PGW levels, and sites with NBPW levels. Their prevalence at both early historical and historical levels has also been reported. Moreover, grounded pottery discs have also been found in the Megalithic site located in North Maidan, Karnataka (Thakur, 2021). Banerjee (1986:235-238) associates forty-nine well-rounded potsherds (c. 1500 BC to c. 200 BC) reported from Nagda with hopscotches, possibly used in a game of hop and win. He records the biggest diameter of 3.22 in. (8.2 cm) and the smallest diameter of 0.47 in. (1.2 cm).

The majority of the grounded potsherds and stones discovered in Vadnagar are identified as discs (Subba Rao and Mehta, 1954). The excavations at Nagara yielded a total of 25 plain circular-shaped discs (Mid-1st millennium BCE to 18th century CE) made from plain potsherds. They are known in Gujarati as *Paiya* and are used in a variety of games. Some specimens are fine and smooth, whereas others are comparatively large and crude. He suggests the large specimens were used in a game known as "*Satodiyun*". In this game, these unperforated discs are struck with a ball, and hence large and sturdy discs are essential (Mehta, 1968).

According to Schadler (2021), one of the most popular children's games of the last centuries is certainly Hopscotch. Despite its enormous diffusion, the origin of the game remains enigmatic. He refers to Frederic Grunfeld (1975), who stated that the floor of the Forum in Rome contains one of the oldest hopscotch designs ever discovered. During the expansion of the Roman empire, the legions-built cobblestone roads connecting the northern countries of Europe with the Mediterranean and Asia Minor. Troops taught the game to the children of France, Germany, and Britain on paved surfaces, which were perfectly suited for it. He explicitly states that there is no design of the Roman forum and, in a broader sense, there is no evidence of hopscotch before the 16th century.

Buddhaghosa's commentaries on the *Sutta Pitaka – the Sumangalavilasini* give a vivid picture of sports and pastimes (Law, 1923). A certain passage (Sect 14, p. 9) in the Pali Brahma-Jala Sutta, or Dialogues of the Buddha, which, according to Rhys-Davids (1923), is one of the most ancient of Buddhist documents, dating back to the 5th century BCE, contains what purport to be the actual words of Gautama himself. This passage provides Buddha's differences over the thoughts and the activities of the unconverted man with those of the disciple, and in doing so, gives an interesting and valuable list of games and amusements with which he disagrees. It consists of a game, "Keeping going over diagrams drawn on the ground so that steps only where on ought to" (Brewster, 1958). Buddhaghosa explains *'Parihara-patham'*- a kind of primitive "hopscotch". The Sinhalese say the steps must be made hopping (Davids 1923:10). Evaluating these references, Schadler (2021) states that this is certainly not yet hopscotch.

Thus, as far as the history of hopscotch is concerned, Schadler (2021) evaluated several other references mentioning hopscotch as an exercise; hopping on one foot for as long as possible or as far as possible; list of 200 games and paintings depicting the game.

Perhaps, none of these mentioned precise rules including a diagram drawn on the ground and the use of a pebble or stone. It is only then; that he mentions references like Johann Fischart's first (1575) and second (1582) German editions of Rabelais' "Gargantua" entitled "Geschichtklitterung". These editions remark a game "Inn die Holl" ("Into hell") and "In Himmel, in d'Höll" ("Into heaven, into hell"), corresponding to "Himmel und Hölle" usually used for Hopscotch in German-speaking countries and still popular nowadays. Particularly important references addressed by him are, Francis Willoughby's chapter "Scotch Hopper" in his unpublished manuscript (1662 – 1672 CE) where for the first time a description of the rules together with a drawing of the plan is presented; secondly in the 17th century paintings and tiles where the game becomes a popular motif in Dutch iconography. In regards to the Seven Stone game, there are hardly any primary sources mentioning its origin except for a few contemporary sources.

The Objective and Justification for the Classification Study

A particular challenge or problem faced in assessing flat-modified or worked potsherds and flat-worked stones was a proper descriptive typology for the entire assemblage (n=4916 specimens) reported from Vadnagar. The issue was thoroughly explained in the paper titled "Gaming in Vadnagar: Defining the typology of flat-worked potsherds and flat-worked stones". The comprehensive classifications derived from the qualitative and quantitative analysis of this study are based on the material, activities, or games in which the artefact was used, as well as a distinct inclination towards specific geometric shapes during its making. One such activity or game in which the majority of the production was used in Vadnagar is the game of Hopscotch and Seven Stones. According to the typological study, it was explicitly intended that the games use medium and large specimens. Based on the observations in excavation reports and the inferences drawn from the paper mentioned above, several objectives were set to classify the flat medium- and large-sized worked potsherds and flat-worked stones. Therefore, the following goals and objectives have been applied

- Determine the regularity of different shapes by assessing the morphology of these artefacts, with the anticipation that some concept would be forthcoming.
- To justify the utility of these artefacts, dimensions such as diameter/width/length, breadth, and thickness will be studied in detail.
- Classify flat-worked potsherds and flat-worked stones (medium and large) and compare their dimensions to understand the entity of each artefact without considering any other factors.

The obtained inferences would differentiate artefacts specifically used for the game of Hopscotch and Seven Stone.

Methodology

To attain the various aims and objectives, first, these artefacts either completely flat or at times convex in section were analysed from a macroscopic perspective. The

following details were recorded for each artefact: antiquity registration, locality, period, type of wares reused, types of stones used, and their respective dimensions and weights. Dimensions like diameter/width/length, breadth and thickness are measured using the Themisto Digital Calliper and a Digital Scale machine was used for weighing. The representative specimens were photographed together and a few specimens of these were drawn with corresponding measurements for reference. The representatives presented in this paper represent a majority of these artefacts.

Classification of Flat-worked Potsherds and Flat-worked Stones (Medium and Large Sized)

A cumulative count of 3968 flat-worked potsherds and flat-worked stones (comprising medium- and large-sized specimens) were obtained from the seven cultural periods of Vadnagar. Thus, the present assemblage was classified primarily based on material analysis. These have been defined into two distinct groups based on the material they originated from.

(i) Artefacts made from flat broken potsherds.
(ii) Artefacts made from flat stones or new raw material.

After a broad distinction based on the material, specimens made from potsherds were classified into two categories: wares consisting of plain pottery and decorated pottery, including specimens that have been decorated since the initial manufacturing stage. During the initial classification process, the discovery of a cache of potsherds (n=115) and a stack or pile of potsherds (n=7), including plain and decorated pottery specimens, was studied separately. For the stone assemblage, various types of stone utilised were studied.

As the excavation for carried out in two localities namely Ambaghat (north-eastern side of Sharmistha Lake) and the southern side of Ambaji Kotha Lake (near Anaj Godown), an attempt has also been made to study the association of these specimens from respected localities. This study will be explained after an overall classification of the assemblage.

Classification and Distribution of Flat Artefacts (Medium and Large Sized) based on Materials

Table 1 show flat artefacts made of plain pottery and decorated pottery from all seven cultural periods, however, there is no artefact made of stone in Period I (pre-Rampart period). Of the 31 specimens, plain pottery ware specimens (n=27), decorated pottery ware specimens (n=3) and a single stone specimen from Period II (Rampart period) have been found.

The artefacts appeared to have increased slightly in Period III (the Kshatrapa period). Plain Pottery ware specimens (n=112) reported from Period III A i.e. early phase of the Kshatrapa period, further showed an increase (n=290) in Period III B i.e. the late phase

of Kshatrapa. The decorated pottery specimens (n=6, n=7 respectively) remained nearly equal in both sub-phases of Period III. A single stone specimen was reported from Period III A. In each phase, different shapes, sizes, and fabrics have been noted which will be explained further. Cache sets were absent in the pre-Rampart, Rampart, and Kshatrapa levels.

Table 1: Period-wise and material-wise distribution of flat artefacts (medium and large-sized)

Material	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Plain Pottery	3	27	112	290	811	878	912	352	49	103	**3537**
Decorative Pottery	2	3	6	7	69	34	50	25	1	3	**200**
Stone	0	1	1	0	4	36	54	7	0	6	**109**
Total	**5**	**31**	**119**	**297**	**884**	**948**	**1016**	**384**	**50**	**112**	**3846**

*Excluding cache of worked potsherds (n=115) and stack or pile of worked potsherds (n=7)

Overall, Period IV (the post-Kshatrapa period) showed an increase in the number of flat artefacts (n=1832). The distribution reveals specimens (n=811) from Period IV A i.e. the early phase of post-Kshatrapa) and specimens (n=878) from Period IV B i.e. the late phase of post-Kshatrapa were made from plain potsherds. Nevertheless, decorated pottery specimens (n=69) from Period IV A and specimens (n=34) from Period IV B were also reported. The cache of worked potsherds (n=115) including both plain and decorative pottery, is a noteworthy discovery from Period IV A. For flat-worked stones, Period IV A (n=4) to Period IV B (n=36), there was a gradual increase in the number of stone specimens, indicating a preference for using stone as a raw material. However, the flat-worked potsherds and flat-worked stones production along with the demand reached its horizon in this period.

The Period V i.e. Solanki Period reported plain pottery ware specimens (n=912) made reusing various wares produced locally and through wares obtained from foreign trade. The decorated pottery specimens (n=20) recorded in this period, compared to the preceding phase, showed a slight decrease in production. A stack or pile of worked potsherds (n=7) is the noteworthy discovery made during this phase. On the other hand, stone specimens (n=54) show progressive growth. Both plain pottery ware specimens (n=352) and decorated pottery specimens (n=25) decreased in the ensuing phase of Period VI i.e. the Sultanate-Mughal. Correspondingly, worked stone specimens (n=7) were also reported from this period.

The final phase Period VII i.e. the Gaekwad period of Vadnagar saw a sharp decline in plain pottery ware specimens (n=49) and decorated pottery specimens (n=1). There is no evidence of flat-worked stone specimens during this period. Nevertheless, overall specimens produced (n=112) reusing from plain pottery ware, decorated pottery, and stone were discovered from talus layers.

Qualitative Analysis

While examining the specimens reported from seven cultural phases, features or attributes like the type of plain wares, types of decorated pottery, style of decoration (observing the slip, wash, paintings, incisions, and graffiti which exist from the parent vessel); types of stones (observing the colour, texture, and mica content); morphological characteristics (made from body, rim or base potsherd); deliberate shape; the fabric (fine, medium or coarse); the firing conditions (well to medium or medium to ill-fired); the presence of husk, grain impressions or textile impressions; and whether the edges are smoothed, polished or unpolished, were all considered.

Quantitative Analysis

The quantitative analysis was based on the distribution of this assemblage across seven cultural periods; the number of wares and stones used; and the number of shapes employed, respectively. The quantification data includes intact specimens with complete uniform smoothing and polishing on the edges; flat potsherds or flat stones that have been broken into desired shapes but have not been polished, and fragmentary specimens which are broken pieces of complete specimens (lacked adequate information about the entire artefact). However, these specimens have been excluded from the dimensional analysis (size and shape).

Manufacturing of Flat-worked Potsherds and Flat-worked Stones (Medium and Large-Sized)

Manufacturing of flat-worked potsherds and flat-worked stones (medium and large-sized) is inferred to be a simple procedure. For the terracotta assemblage, it is quite evident that fragments of broken or discarded ceramic vessels were used as raw material. However, for stone specimens, it is suggested that entirely new raw materials or fragments of stone objects produced on-site were used.

An in-detail investigation has also shown that deliberate or specific selection of geometric shapes was common during manufacturing. The wide range of shapes made it possible to build a descriptive typology. Examination revealed that 11 shapes were formed for flat-worked potsherds and flat-worked stones. Disc-shaped specimens have been smoothed or grounded to achieve a refined or rough circular shape. Triangle, square, and rectangle-shaped specimens have had their edges smoothed or curved to form square or rectangular shapes. Elliptical or oval specimens have been smoothed to create rounded rectangular or egg-shaped forms. The deliberate or desired shapes in which these artefacts were created are Circular, Triangle, Square, Rectangle, Pentagonal, Hexagonal, Heptagonal/Septagonal, Octagonal, Nonagon, Elliptical/ oval/ ovoid and Irregular.

Any abrasive surface with a hardness factor greater than that of a ceramic fabric or stone was probably used during the shaping process. These specimens were chipped into desired shapes, then the periphery or edges were grounded and further polishing

was done using abrasive rocks. The required shapes are simple and generally have negligible market value. As a result, it is proposed that the flat-worked potsherds and flat-worked stones were used for recreational purposes and entertainment, rather than serving as any form of currency for gambling. It is suggested that these artefacts cannot be assigned a significant value because they can be easily produced and made from local wares. If one were to misplace or damage these artefacts, one might readily manufacture a substitute.

A qualitative examination of the analysed samples indicates that the observed variations were likely influenced by factors such as the following:

- The amount of effort exerted by the manufacturer or craftsmen.
- The amount of effort required to transform the shape of the raw material into a desired/deliberated shape,
- The level of geometric or aesthetic "perfection" demanded by the manufacturer. The demand for certain fabrics of locally produced ware.

These slight variations in material, shapes, decorations, and quantity indicate that the producer went to great extents to meet customer demands for geometric and aesthetic "perfection". Each specimen was examined to develop a typology based on the regularity of different shapes, wares (plain and decorated) and various stones. The illustrative artefact presented in this paper represents a majority of these artefacts. Furthermore, they offer a precise representation of the diverse range of shapes employed in the production of this assemblage.

Distribution of Flat-worked Potsherds According to the Plain Pottery Wares

The majority of terracotta assemblages are made by reusing the plain pottery wares (Figures 1-7, Tables 2-3). This includes specimens made from locally produced ceramics at Vadnagar and specimens from fragments of Torpedo jars (Mesopotamian origin) which were obtained through long-distance trading connections. It is essential to note that these artefacts were likely made from fragments of intact containers acquired at Vadnagar through commerce, rather than being imported as fragmented pieces.

Table 2: Major Plain Pottery Wares have been reused for the terracotta assemblage

No. of Wares	Type of Plain Pottery	Features of the artefacts	Morphological characteristics	Fabric observed	Firing conditions observed
1	Red Ware	Predominant ware to be reused, no special surface treatment, husk and grain impressions on both surfaces	Reused body fragments of globular pots, storage jars, bowls, basins; the base of bowls;	Fine to medium, medium to coarse	Well to medium fired, medium to ill-fired

			the rim of bowls		
2	Red Slipped Ware	The second predominant ware to be reused; is special treatments like red slip on external and internal surfaces (dark to light shades)	Reused of body fragments of globular pots, storage jars, bowls, basins; bases of bowls; rims of bowls	Fine to medium, medium to coarse	Well to medium fired, medium to ill-fired
3	Grey Ware	No surface treatment, coarse sand granules, husk impressions on both surfaces	Reused body fragments of globular pots, bowls, and basins; the base of bowls	medium to coarse	Medium to ill-fired
4	Black Burnished Ware	Special treatments like jet black slip on the external surface, and burnishing marks are visible	Reused body fragments of globular pots and storage jars; the rim of globular pots	medium to coarse	Medium to ill-fired
5	Black and Red Ware	The third predominant ware to be reused; the coarse type having a thick section treated with a light orange slip on the external surface while the inner surface being black is and burnished; the fine type has a thin section treated with a thick dark red slip on the external surface while the inner surface has burnishing marks	Reused body fragments of globular pots, storage jars, basins, and bowls; the base of globular pots, storage jars, bowls; the rim of globular pots and storage jars	Fine to medium, medium to coarse	Well to medium fired, medium to ill-fired
6	Mica Washed Red Ware	Treatment like mica wash on both surfaces; rare specimens having mica found in the clay; specimens with	Reused body fragments of globular pots and *handi*	Fine to medium	Well to medium-fired

		intentionally added observed			
7	Rang Mahal Type	Black painting decoration on pinkish-to-reddish slip	Reused body fragment	Fine fabric	Well-fired
8	Fine Red Slipped Ware	Special treatment like fine red slip; metallic and glossy surface in appearance	Reused body fragments of small globular pots, and bowls; the rim of bowls	Fine fabric	Well-fired
9	Kaolin Ware	White creamy porcelain clay, less tempering material observed	Reused body fragments of small globular pots and bowls	Fine fabric	Well-fired
10	Torpedo jar sherds	Treatment like buff colour on the external surface, black coating of bitumen on the inner surface	Reused body fragments of the Torpedo jars	Medium to coarse	Well-fired
11	Glazed Ware	A glossy layer of vitreous substance' plain monochrome (white) in appearance	Reused body fragment probably of a bowl or a dish	Fine fabric	Well-fired

The distribution of flat-worked potsherds made from local wares and Torpedo Jar sherds is reflected in Table 3.

Period I report worked potsherds of Red Ware (n=2) and Black & Red Ware (single specimen). Period II displays a total of 27 specimens, including Red Ware (n=19), Red Slipped Ware (n=4), Grey Ware (single), Black & Red Ware (single), and of Mica Washed Red Ware (n=2). Red Slipped Ware specimens are seen to make their first appearance in this period. Overall, there is a subsequent rise in Period III specimens (n=402), where Red Ware, Red Slipped Ware, Grey Ware, Black & Red Ware and Mica Washed Red Ware appear in common. Sub-phase Period III B reports a rare example manufactured from the Rang Mahal type.

In Period IV, there are specimens made from new wares in addition to commonly observed wares from Period I up to Period III. Black Burnished Ware specimens found from this period are medium to coarse in fabric. In Period IV A, Fine Red Slipped Ware (n=3) and Kaolin ware (n=2) varying from fine to medium fabric are found. Torpedo Jar sherd specimens (9) reported from Period IV B is another noteworthy occurrence.

Figure 1: The geometric shapes identified in flat-worked potsherds made from Red Ware and Red Slipped Ware

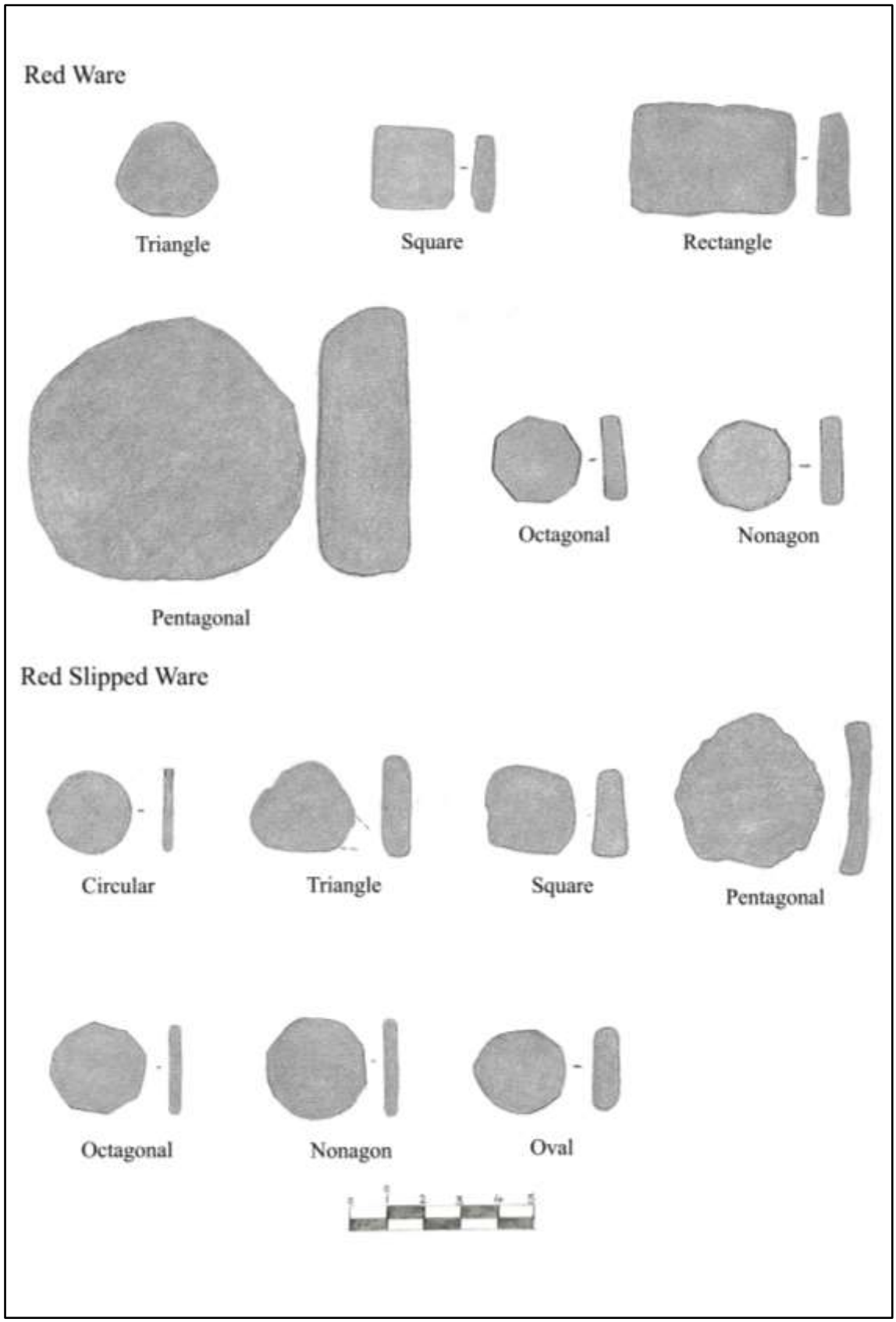

Figure 2: Drawings of the geometric shapes identified in flat-worked potsherds

Figure 3: The geometric shapes identified in flat-worked potsherds made from Grey Ware and Black Burnished Ware

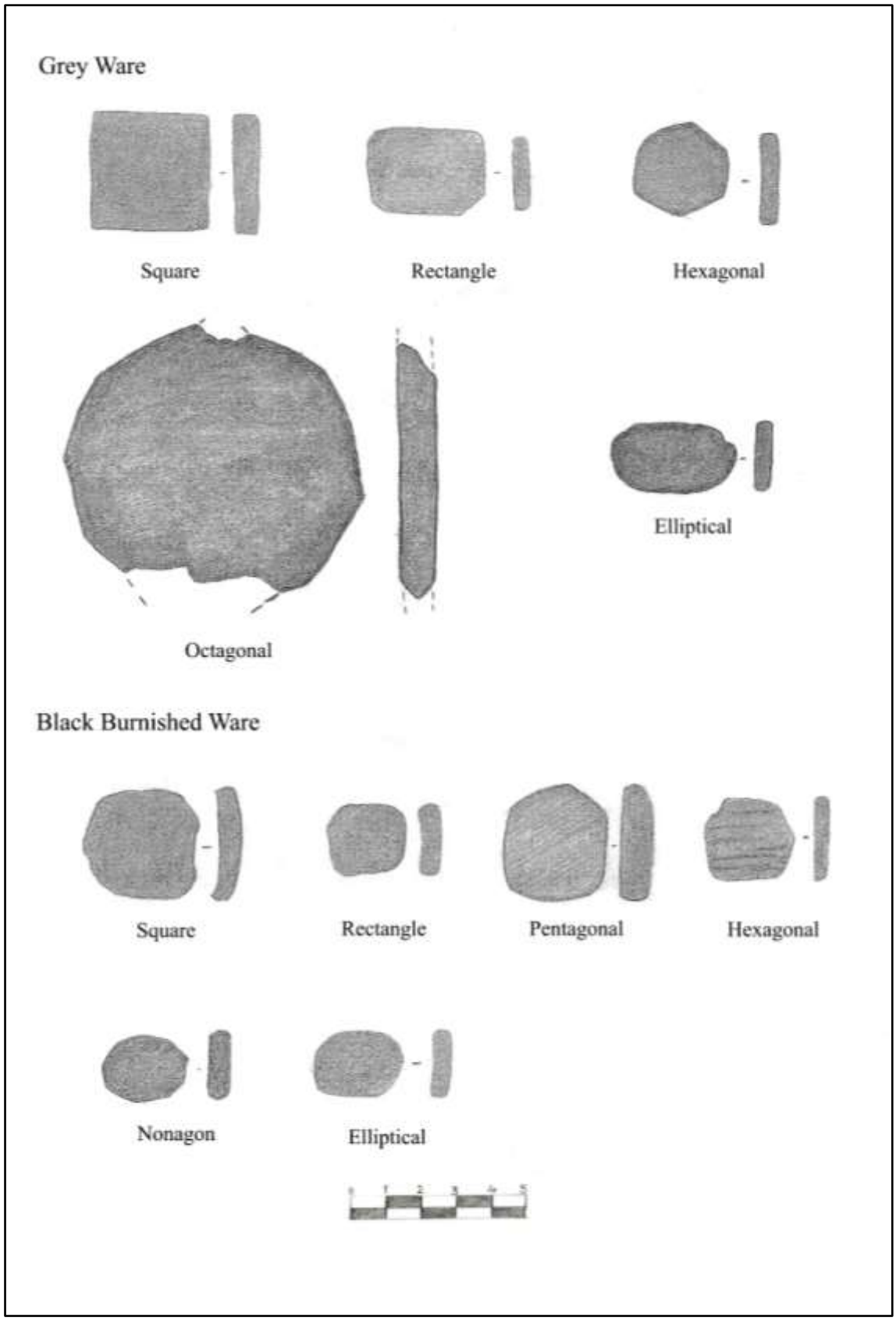

Figure 4: Drawings of the geometric shapes identified in flat-worked potsherds

Figure 5: The geometric shapes identified in flat-worked potsherds made from Black and Red Ware and Mica Washed Red Ware

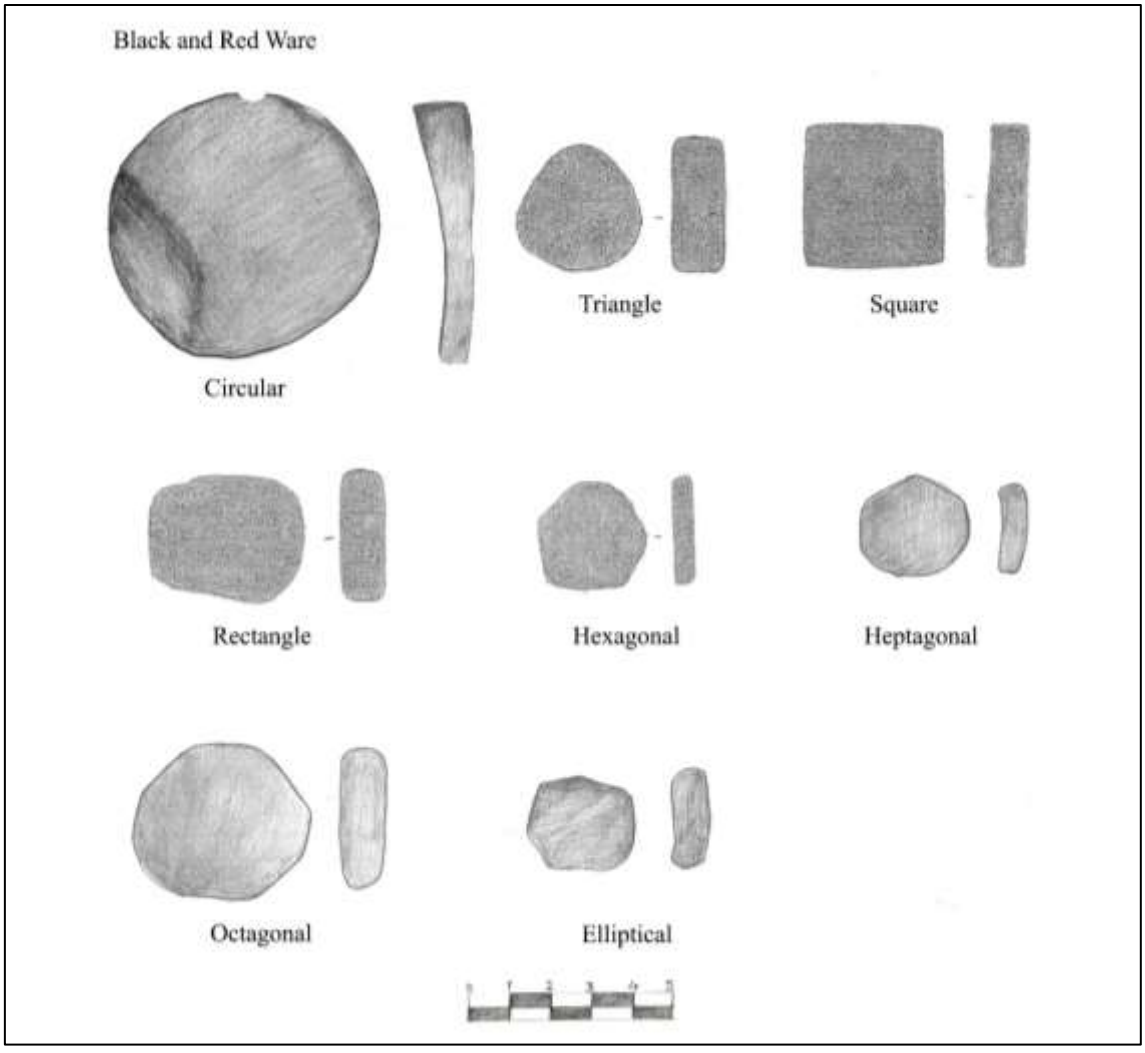

Figure 6: Drawings of the geometric shapes identified in flat-worked potsherds

Table 3: Period-wise and Plain Pottery Ware-wise distribution of flat-worked potsherds

Plain Pottery Ware	**Period**									**Talus**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**	**Layers**	
Red	2	19	70	210	450	440	447	135	34	58	**1865**
Red Slipped	0	4	16	40	120	86	159	98	7	11	**541**
Grey	0	1	2	1	60	87	94	49	3	11	**308**
Black Burnished	0	0	0	0	69	142	105	48	3	9	**376**
Black and Red	1	1	22	27	100	112	94	22	2	13	**394**
Mica Washed Red	0	2	2	11	6	2	7	0	0	0	**30**
Rang Mahal	0	0	0	1	0	0	0	0	0	0	**1**
Fine Red Slipped	0	0	0	0	3	0	1	0	0	0	**4**
Kaolin	0	0	0	0	2	0	0	0	0	1	**3**
Torpedo	0	0	0	0	1	9	4	0	0	0	**14**
Glazed	0	0	0	0	0	0	1	0	0	0	**1**
Total	**3**	**27**	**112**	**290**	**811**	**878**	**912**	**352**	**49**	**103**	**3537**

Figure 7: The geometric shapes identified in flat-worked potsherds made from Rang Mahal Type, Fine Red Slipped Ware, Kaolin Ware, Torpedo Jar sherds and Glazed Ware

Compared to previous cultural phases, Period V reveals the highest number of wares (n=8 plain types) used for production. Amongst these, Red Ware, Red Slipped Ware, and Grey Ware are the prevalent types of wares being reused. It is suggested that the variety of wares used in production reflects the manufacturer's aesthetic requirements and the availability of potsherds during this period.

The succeeding Period VI deposit shows the reuse of Red Ware, Red Slipped Ware, Grey Ware, Black Burnished Ware, as well as Black & Red Ware for production. Fine Red Slipped Ware and Torpedo Jar sherds examples ceased to exist at this point. Similarly, Period VI and Period VII continued to feature the plain pottery ware specimens that were used. However, the quantity varies and shows a decline with time. Talus layers show exquisite fine Red Slipped Ware and the most commonly used wares for worked potsherds.

Red Ware Specimens

In this most common and predominant type of ware, a maximum number of potsherds were reused for the production of hopscotch and seven-stone game specimens. There are 1865 specimens recorded in total, spanning the seven cultural phases (Tables 2 and 4; Figures 1 and 2).

Table 4: Period-wise and Shape-wise Distribution of Specimens of Flat-worked Potsherds in Red Ware

Shapes	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Circular	0	3	8	18	54	101	71	14	3	17	**289**
Triangle	0	0	0	0	1	0	0	0	0	0	**1**
Square	0	0	0	4	12	8	4	4	1	1	**34**
Rectangle	0	1	1	1	4	5	5	3	0	0	**20**
Pentagonal	0	7	20	91	189	150	157	48	17	17	**696**
Hexagonal	0	2	17	29	77	57	68	19	5	4	**278**
Heptagonal	0	4	8	14	42	39	44	17	3	7	**178**
Octagonal	0	0	1	1	4	4	3	4	1	1	**19**
Nonagonal	0	0	0	0	1	0	2	1	0	0	**4**
Elliptical	0	0	3	11	19	21	19	4	1	3	**81**
Irregular	1	2	12	41	36	37	46	18	2	8	**203**
Fragmentary	1	0	0	0	11	18	28	3	1	0	**62**
Total	**2**	**19**	**70**	**210**	**450**	**440**	**447**	**135**	**34**	**58**	**1865**

Table 4 illustrates all eleven desired shapes employed for the production. Prevalent among these is the pentagonal shape followed by the circular shape. It also observed that Period IV witnessed the desire and demand for all the eleven shapes.

Red Slipped Ware Specimens

The second most common type of ware, Red Slipped Ware, has produced a total of 541 worked potsherds. These specimens appear from Period II and continue up to Period VII (Tables 2 and 5, Figures 1 and 2).

Table 5: Period-wise and shape-wise distribution of Red Slipped Ware flat-worked potsherds

Shapes	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Circular	0	1	2	7	13	15	20	7	2	3	**70**
Triangle	0	0	0	0	1	0	0	0	1	0	**2**
Square	0	0	1	0	2	0	5	3	1	0	**12**
Rectangle	0	0	0	0	3	0	5	1	0	0	**9**
Pentagonal	0	1	5	10	44	20	49	44	0	2	**175**
Hexagonal	0	1	3	9	12	14	16	11	2	2	**70**
Heptagonal	0	0	0	5	17	8	22	11	0	1	**64**
Octagonal	0	0	0	2	2	1	4	2	0	1	**12**
Nonagonal	0	0	0	0	1	0	2	0	1	0	**4**
Elliptical	0	0	1	0	8	6	9	4	0	0	**28**
Irregular	0	1	4	7	12	19	18	13	0	2	**76**
Fragmentary	0	0	0	0	5	3	9	2	0	0	**19**
Total	**0**	**4**	**16**	**40**	**120**	**86**	**159**	**98**	**7**	**11**	**541**

Table 5 illustrates all eleven desired shapes employed for the production. Prevalent among these is the pentagonal shape. Circular shape and hexagonal shape specimens are found in equal. It also observed that Period IV witnessed the desire and demand for all the eleven shapes. This was followed succeeding Solanki phase.

Table 6: Period-wise and shape-wise distribution of Grey Ware flat-worked potsherds

Shapes	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Circular	0	0	0	0	4	23	11	2	2	4	**46**
Triangle	0	0	0	1	0	0	0	0	0	0	**1**
Square	0	0	0	0	3	1	0	3	0	0	**7**
Rectangle	0	0	0	0	0	1	2	1	0	0	**4**
Pentagonal	0	1	0	0	32	27	33	14	1	2	**110**
Hexagonal	0	0	1	0	7	13	12	14	0	2	**49**
Heptagonal	0	0	1	0	4	8	10	7	0	3	**33**
Octagonal	0	0	0	0	3	0	3	0	0	0	**6**
Nonagonal	0	0	0	0	0	0	0	0	0	0	**0**
Elliptical	0	0	0	0	2	3	3	0	0	0	**8**
Irregular	0	0	0	0	2	9	13	4	0	0	**28**
Fragmentary	0	0	0	0	3	2	7	4	0	0	**16**
Total	**0**	**1**	**2**	**1**	**60**	**87**	**94**	**49**	**3**	**11**	**308**

Grey Ware Specimens

A total of 308 specimens were made using Grey Ware potsherds. They have been reported from Period II continuing up to Period VII (Tables 2 and 6; Figures 3 and 4).

Table 6. illustrates that except for the nonagon shape, the rest of the other ten shapes were employed for Grey Ware. Pentagonal-shaped specimens remained prevalent. Circular shape and hexagonal shape were found to be nearly equal.

Black Burnished Ware Specimens

A total of 376 specimens were made using Black Burnished Ware potsherds. They have been reported from Period IV continuing up to Period VII (Tables 2 and 7; Figure 3 and 4).

Table 7: Period-wise and shape-wise distribution of Black Burnished Ware flat-worked potsherds

Shapes	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Circular	0	0	0	0	15	27	14	1	0	1	**58**
Triangle	0	0	0	0	0	1	0	1	0	0	**2**
Square	0	0	0	0	0	3	0	2	0	0	**5**
Rectangle	0	0	0	0	0	2	0	0	0	1	**3**
Pentagonal	0	0	0	0	20	47	37	20	1	1	**126**
Hexagonal	0	0	0	0	13	23	13	6	0	2	**57**
Heptagonal	0	0	0	0	9	13	19	5	0	2	**48**
Octagonal	0	0	0	0	0	4	1	1	0	0	**6**
Nonagonal	0	0	0	0	0	0	1	0	1	1	**3**
Elliptical	0	0	0	0	2	5	8	3	0	1	**19**
Irregular	0	0	0	0	8	13	7	8	1	0	**37**
Fragmentary	0	0	0	0	2	4	5	1	0	0	**12**
Total	**0**	**0**	**0**	**0**	**69**	**142**	**105**	**48**	**3**	**9**	**376**

Table 7 illustrates that all the eleven desired shapes were employed for worked potsherds. Pentagonal shapes remained prevalent. Circular-shaped (n=58) and hexagonal-shaped (n=48) flat-worked potsherds were found to be nearly equal.

Black and Red Ware Specimens

A total of 394 specimens were made using Black and Red Ware potsherds. They have been reported from all seven cultural periods (Tables 2 and 8; Figures 5 and 6).

Table 8 illustrates that all the eleven desired shapes were reported for Black and Red Ware specimens. Pentagonal-shaped specimens (n=125) were to be prevalent. While the circular-shaped specimens (n=71) and hexagonal-shaped specimens (n=63) were found to be nearly equal.

Table 8: Period-wise and shape-wise distribution of Black and Red Ware flat-worked potsherds

Shapes	Period									Talus Layers	Total
	I	II	III A	III B	IV A	IV B	V	VI	VII		
Circular	0	0	1	4	19	27	15	1	0	4	**71**
Triangle	0	0	0	0	1	1	1	1	0	0	**4**
Square	0	0	0	0	3	3	2	2	0	0	**10**
Rectangle	0	0	1	1	2	3	2	0	0	0	**9**
Pentagonal	0	0	9	8	37	28	34	4	0	5	**125**
Hexagonal	0	1	4	6	14	14	17	5	0	2	**63**
Heptagonal	1	0	2	2	9	13	7	1	0	1	**36**
Octagonal	0	0	0	0	2	1	2	1	0	0	**6**
Nonagonal	0	0	0	0	1	0	0	0	0	0	**1**
Elliptical	0	0	0	1	6	11	3	1	0	1	**23**
Irregular	0	0	4	4	6	11	8	5	1	0	**39**
Fragmentary	0	0	1	1	0	0	3	1	1	0	**7**
Total	**1**	**1**	**22**	**27**	**100**	**112**	**94**	**22**	**2**	**13**	**394**

Mica Washed Red Ware Specimens

A total of 30 specimens were made using Mica Washed Red Ware potsherds. They have been reported from Period II continuing up to Period V (Tables 2 and 9; Figure 5).

Table 9: Period-wise and shape-wise distribution of Mica Washed Red Ware flat-worked potsherds

Period Shapes	Period									Talus Layers	Total
	I	II	III A	III B	IV A	IV B	V	VI	VII		
Circular	0	1	0	2	3	1	0	0	0	0	**7**
Triangle	0	0	0	0	0	0	0	0	0	0	**0**
Square	0	0	0	0	0	0	0	0	0	0	**0**
Rectangle	0	0	0	0	0	0	0	0	0	0	**0**
Pentagonal	0	1	0	1	2	0	1	0	0	0	**5**
Hexagonal	0	0	0	5	0	0	2	0	0	0	**7**
Heptagonal	0	0	1	1	0	0	0	0	0	0	**2**
Octagonal	0	0	0	0	0	0	1	0	0	0	**1**
Nonagon	0	0	0	0	0	1	0	0	0	0	**1**
Elliptical	0	0	0	2	0	0	0	0	0	0	**2**
Irregular	0	0	0	1	1	0	3	0	0	0	**5**
Fragmentary	0	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**2**	**1**	**12**	**6**	**2**	**7**	**0**	**0**	**0**	**30**

Table 9 illustrates that out of the eleven desired shapes, circular-shaped and hexagonal-shaped specimens (n=7 of each) have been reported in equal quantity. Likewise, pentagonal-shaped and irregular-shaped specimens (n=5) are reported as equal.

Rang Mahal Type Specimens

A single hexagonal-shaped specimen was made using a Rang Mahal-type potsherd. It has been reported from Period III B. This peripherally smoothed artefact bears black oblique curved strokes set in horizontal painted bands, one on the upper side and two on the lower on the red slip (Table 2 and Figure 7).

Fine Red Slipped Ware Specimens

A total of 4 specimens were made using Fine Red Slipped Ware potsherds. They have been reported from Period IV A and Period V. Out of the eleven desired shapes, pentagonal-shaped (n=2), heptagonal-shaped (n=1) and irregular-shaped (n=1) specimens have been reported (Table 2 and Figure 7).

Kaolin Ware Specimens

A total of 3 specimens were made using Kaolin Ware potsherds. They have been reported from Period IV A and the talus layer. Out of the eleven desired shapes, a single specimen each circular, pentagonal and heptagonal has been reported (Table 2 and Figure 7).

Torpedo Jar Sherds

A total of 14 specimens were made using Torpedo Jar potsherds. They have been reported from Period IV and Period V (Table 2 and 10; Figure 7)

Table 10: Period-wise and shape-wise distribution of Torpedo Jar flat-worked potsherds

Shapes	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Circular	0	0	0	0	0	2	2	0	0	0	**4**
Triangle	0	0	0	0	0	0	0	0	0	0	**0**
Square	0	0	0	0	0	0	0	0	0	0	**0**
Rectangle	0	0	0	0	0	0	0	0	0	0	**0**
Pentagonal	0	0	0	0	0	4	0	0	0	0	**4**
Hexagonal	0	0	0	0	0	1	1	0	0	0	**2**
Heptagonal	0	0	0	0	0	2	1	0	0	0	**3**
Octagonal	0	0	0	0	0	0	0	0	0	0	**0**
Nonagon	0	0	0	0	0	0	0	0	0	0	**0**
Elliptical	0	0	0	0	0	0	0	0	0	0	**0**
Irregular	0	0	0	0	1	0	0	0	0	0	**1**
Fragmentary	0	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**1**	**9**	**4**	**0**	**0**	**0**	**14**

Table 10 illustrates that out of the eleven desired shapes, circular-shaped and pentagonal-shaped specimens (n=4 respectively) have been reported in equal quantity. Other than these two shapes, hexagonal-shaped (n=2), heptagonal-shaped (n=3) and single irregularly shaped specimens have also been reported.

Glazed Ware Specimen

A single hexagonal-shaped specimen was made from a Glazed Ware potsherd. This edge-curved specimen reported from Period V has undergone slight damage. Likewise, it is of fine fabric and well-fired in condition (Table 2 and Figure 7).

Table 11: Major Decorated Pottery varieties have been reused for the terracotta assemblage (Figures 8-10)

No. of Wares	Type of Decorated Pottery	Features on the Artefacts	Morphological Characteristics	Fabric Observed	Firing Conditions Observed
1	Stamped decoration variety	Positive stamped impressions; Geometric patterns like oblique strokes, multiple zig-zag lines, cord impressions; floral motif of flowers	Reused body fragments of globular pots, storage jars, bowls	Fine to medium	Well to medium-fired
2	Graffiti	Unidentifiable sharp cur-marks and incised lines	Reused body fragment of globular pot or storage jar	medium to coarse	Medium fired
3	Applique decoration variety	Appliqued clay with positive impressions: Stamped Circular dots on the clay, concentric circles, incised oblique strokes floral motifs,	Reused body fragments of globular pots, bowls, and basins; bases of bowls	Medium to coarse	Medium to ill-fired
4	Incised decoration variety	The second predominant decorated pottery to be reused; major incised decorations on Red Slip with buff background and Black Burnished Ware; decorations	Reused body fragments of globular pots and basins	Fine to medium	Well to medium-fired

		like horizontal and vertical lines; horizontal and vertical grooves; single and double wavy lines; crisscross patterns; single and double arches; deeply incised spiral designs; set of curves			
5	Painting variety	Predominantly decorated pottery; Paintings visible in monochrome and bi-chrome; colours used are black, white, purple, chocolate, red, buff and brown; designs are naturalistic, geometric and non-geometric patterns	Reused body fragments of globular pots	Fine to medium	Well to medium-fired

Distribution of Decorated Potsherds in Seven Cultural Periods

Decorated category of pottery from the site include stamped decoration, graffiti, applique decoration, incised decoration and painted variety (Tables 11 and 12, Figures 8-10).

Table 12: Period-wise and Decorated Pottery-wise distribution of flat-worked potsherds

Decorative Pottery	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Stamped Decoration	0	0	0	0	1	3	0	1	0	0	**5**
Graffiti	0	0	0	0	0	0	0	1	0	0	**1**
Applique Decoration	0	0	0	0	0	1	7	0	0	1	**9**
Incised Decoration	0	1	0	0	5	0	13	16	0	1	**36**
Painted Variety	2	2	6	7	63	30	30	7	1	1	**149**
Total	**2**	**3**	**6**	**7**	**69**	**34**	**50**	**25**	**1**	**3**	**200**

Stamped Decoration on Variety Specimens: A total of 5 specimens were made using Stamped decorated potsherds. They have been reported from Period IV and Period V. Out of the eleven desired shapes, hexagonal-shaped and heptagonal-shaped specimens (n=2 respectively) have been reported in equal quantity. A single irregular-shaped specimen has been reported from Period IV B (Tables 11 and 12; Figures 8 and 10).

Figure 8: The geometric shapes identified in flat-worked potsherds made from Stamped variety, Graffiti and Applique variety

Graffiti Specimen: A single circular-shaped specimen made from Red Ware potsherd has been reported from Period VI. This specimen bears unidentifiable graffiti marks on the obverse surface and two incised lines cutting each other on the reverse surface. It is edge-ground, in medium fabric and is medium-fired (Tables 11 and 12; Figures 8 and 10).

Applique Decoration on Variety Specimens: A total of 9 specimens were made using Applique decorated potsherds. They have been reported from Period IV B and Period V (Tables 11 and 13; Figures 8 and 10).

Figure 9: The geometric shapes identified in flat-worked potsherds made from the Incised variety and Painted variety

Table 13: Period-wise and shape-wise distribution of applique decoration variety flat-worked potsherds

Shapes	Period									Talus Layers	Total
	I	II	III A	III B	IV A	IV B	V	VI	VII		
Circular	0	0	0	0	0	1	2	0	0	0	**3**
Triangle	0	0	0	0	0	0	0	0	0	0	**0**
Square	0	0	0	0	0	0	0	0	0	0	**0**
Rectangle	0	0	0	0	0	0	0	0	0	0	**0**
Pentagonal	0	0	0	0	0	0	2	0	0	0	**2**
Hexagonal	0	0	0	0	0	0	1	0	0	0	**1**
Heptagonal	0	0	0	0	0	0	0	0	0	0	**0**
Octagonal	0	0	0	0	0	0	0	0	0	0	**0**
Nonagon	0	0	0	0	0	0	0	0	0	0	**0**
Elliptical	0	0	0	0	0	0	0	0	0	1	**1**
Irregular	0	0	0	0	0	0	1	0	0	0	**1**
Fragmentary	0	0	0	0	0	0	1	0	0	0	**1**
Total	**0**	**0**	**0**	**0**	**0**	**1**	**7**	**0**	**0**	**1**	**9**

Table 13 illustrates that out of eleven desired shapes, circular-shaped specimens (n=3) were found in maximum. These were followed by pentagonal-shaped specimens (n=2) from Period V. Single specimens each of hexagonal, elliptical and irregular shapes have also been reported.

Table 14: Period-wise and shape-wise distribution of Incised decoration variety flat-worked potsherds

Shapes	Period									Talus Layers	Total
	I	II	III A	III B	IV A	IV B	V	VI	VII		
Circular	0	0	0	0	1	0	4	2	0	0	**7**
Triangle	0	0	0	0	0	0	0	0	0	0	**0**
Square	0	0	0	0	0	0	0	0	0	0	**0**
Rectangle	0	0	0	0	0	0	0	1	0	0	**1**
Pentagonal	0	0	0	0	2	0	2	5	0	0	**9**
Hexagonal	0	0	0	0	0	0	2	1	0	0	**3**
Heptagonal	0	1	0	0	1	0	1	1	0	0	**4**
Octagonal	0	0	0	0	0	0	2	1	0	0	**3**
Nonagon	0	0	0	0	0	0	0	1	0	0	**1**
Elliptical	0	0	0	0	0	0	1	0	0	0	**1**
Irregular	0	0	0	0	1	0	1	4	0	1	**7**
Fragmentary	0	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**1**	**0**	**0**	**5**	**0**	**13**	**16**	**0**	**1**	**36**

Incised Decoration Variety Specimens: A total of 36 specimens were made using Incised decorated potsherds. They have been reported from Period II and Period IV

continuing up to Period VI. A maximum number of worked specimens (n=16) have been reported from Period VI (Tables 11, 12 and 14; Figures 9 - 10).

Table 15 illustrates that out of the eleven shapes, pentagonal-shaped specimens (n=9) have been reported in maximum number. Likewise, circular-shaped and irregularly shaped specimens (n=7) have been reported in equal quantity. Rest includes a single specimen each of rectangle, nonagon irregular, hexagonal shaped (n=3), heptagonal shaped (n=4) and octagonal shaped (n=3).

Painting Variety Specimens: A total of 149 specimens were made using Painted variety potsherds. They have been reported from all seven cultural periods. Period IV reports a maximum number of worked specimens (n=93) (Tables 11, 12 and 15; Figures 9 and 10).

Table 15: Period-wise and shape-wise distribution of Painted variety flat-worked potsherds

Shapes	**Period**									**Talus**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**	**Layers**	
Circular	0	0	0	1	7	8	4	2	0	0	**22**
Triangle	0	0	0	0	0	0	0	0	0	0	**0**
Square	0	0	0	1	2	1	0	0	0	0	**4**
Rectangle	0	0	0	0	2	0	0	0	0	0	**2**
Pentagonal	1	0	3	4	14	8	10	2	1	1	**44**
Hexagonal	0	0	0	1	12	7	5	0	0	0	**25**
Heptagonal	1	1	0	0	11	2	5	1	0	0	**21**
Octagonal	0	1	0	0	1	1	1	0	0	0	**4**
Nonagon	0	0	0	0	0	0	0	0	0	0	**0**
Elliptical	0	0	0	0	2	0	0	0	0	0	**2**
Irregular	0	0	3	0	10	2	2	2	0	0	**19**
Fragmentary	0	0	0	0	2	1	3	0	0	0	**6**
Total	**2**	**2**	**6**	**7**	**63**	**30**	**30**	**7**	**1**	**1**	**149**

Table 15 illustrates that out of the eleven desired shapes, only triangle and nonagon specimens have not been reported. Among the rest, pentagonal-shaped specimens (n=44) have been reported in maximum quantity.

Cache and Sets

Cache of Worked Potsherds: Along with Plain Pottery and Decorated Pottery specimens, a cache of worked potsherds (n=115) was reported from Period IV A. It includes both, plain pottery specimens (Red Ware, Red Slipped Ware, Grey Ware, Black Burnished Ware, Black & Red Ware, Fine Red Slipped Ware) and decorated pottery (Painted variety) specimens. The worked potsherds of these wares were classified into respective shapes. Fabric varies from fine to medium. They are well to medium-fired in

conditions. They are well to medium-fired in conditions. These specimens vary in dimension range from 20.22 mm to 52.86 mm in diameter/width, 3.17 mm to 10.19 mm in thickness and 1 gm to 21 gm in weight (Table 16; Figure11).

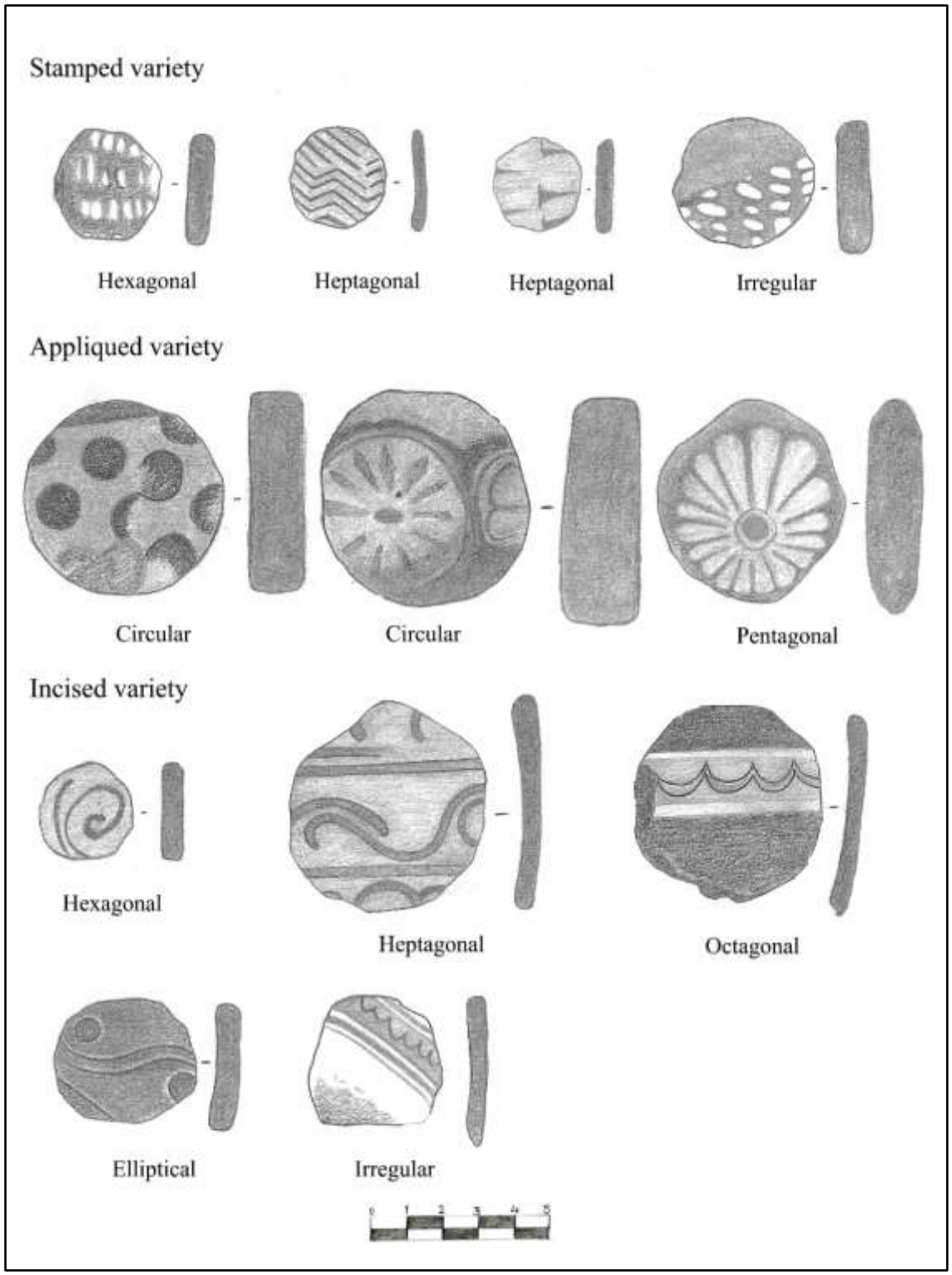

Figure 10: Drawings of the geometric shapes identified in flat-worked potsherds

Table 16: Ware-wise and shape-wise distribution of Cache specimens from Period IV A

Cache–Wares / Shapes	Red Ware	Red Slipped Ware	Grey Ware	Black Burnished Ware	Black and Red Ware	Fine Red Slipped Ware	Painted variety	Total
Circular	1	1	0	1	1	0	1	**5**
Triangle	1	0	0	0	0	0	0	**1**
Square	3	1	1	0	0	0	0	**5**
Rectangle	0	0	0	0	0	0	0	**0**
Pentagonal	28	8	3	0	6	1	3	**49**
Hexagonal	15	2	0	0	4	0	2	**23**
Heptagonal	8	2	4	1	0	0	0	**15**
Octagonal	3	1	0	0	1	0	0	**5**
Nonagonal	0	0	0	0	0	0	0	**0**
Elliptical	2	1	1	0	1	0	0	**5**
Irregular	2	0	1	0	2	0	2	**7**
Total	**63**	**16**	**10**	**2**	**15**	**1**	**8**	**115**

The Types of Stones Utilized

The types of stone used include sandstone, schist, and basalt (Figure 12).

Table 17. Major types of stones used as new raw material or reused fragments for the stone assemblage

No.	Type of stone	Features of the artefacts	Morphological characteristics	Texture observed	Surfaces observed
1	Sandstone	Prevalent stone material easily worked; chipped and cracked surface observed; found in colours like yellowish-brown, yellowish-orange, creamish-white, reddish-brown, reddish-yellow, pinkish-brown, pinkish-grey, greyish brown, dark grey; locally available	Used from new raw material or reused from fragments like chunks, flat tiles,	Fine to medium-grained, medium to coarse-grained	Smooth surface, medium-rough and rough surface
2	Schist	Dark green to bluish green in colour; mica contents, splits marks on few specimens	Used from new raw material or reused from fragments like chunks, flat tiles	Fine-grained texture	Smooth surface

3	Basalt	Dark grey	Used from new raw material or reused from fragments like chunk	Fine-grained texture	Smooth surface

Distribution of Various Shapes of Flat-worked Stones

The identified shapes of flat-worked stones include circular, triangular, square, rectangular, pentagonal, hexagonal, octagonal, nonagonal, elliptical, and irregular forms (Figure 12).

Table 18: Period-wise and shape-wise distribution of flat-worked stones

Shapes	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**IIIB**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Circular	0	0	1	0	1	12	19	0	0	0	**33**
Triangle	0	0	0	0	0	0	0	0	0	0	**0**
Square	0	0	0	0	1	1	0	0	0	0	**2**
Rectangle	0	0	0	0	0	0	2	0	0	0	**2**
Pentagonal	0	0	0	0	1	12	15	5	0	3	**36**
Hexagonal	0	1	0	0	0	5	7	0	0	2	**15**
Heptagonal	0	0	0	0	1	3	6	1	0	1	**12**
Octagonal	0	0	0	0	0	2	0	0	0	0	**2**
Nonagon	0	0	0	0	0	0	0	1	0	0	**1**
Elliptical	0	0	0	0	0	1	1	0	0	0	**2**
Irregular	0	0	0	0	0	0	4	0	0	0	**4**
Fragmentary	0	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**1**	**1**	**0**	**4**	**36**	**54**	**7**	**0**	**6**	**109**

Table 19: Diameter/Width/Length-wise and material-wise distribution of the artefact assemblage

Diameter/Width/ Length (In mm) / **Material**	**20 – 29.99**	**30– 39.99**	**40– 49.99**	**50 – 59.99**	**60– 69.99**	**70– 79.99**	**80– 89.99**	**90 – 99.99**	**100– 109.99**	**110 – 119.99**	**Total**
Plain Pottery Wares	1939	962	325	111	43	23	12	5	1	0	**3421**
Decorated Pottery	91	65	22	11	3	0	0	0	0	1	**193**
Stone	57	27	18	6	1	0	0	0	0	0	**109**
Total	**2087**	**1054**	**365**	**128**	**47**	**23**	**12**	**5**	**1**	**1**	**3723**

As of now, Table 18 illustrate that a single specimen each of worked stone has been recorded from the earliest level i.e., Period II and from the early deposit of Period III. The succeeding phase Period IV has shown an increase in the quantity of specimens

(n=38), out of which the majority was confined to the late deposit (n=34) with a variety of shapes. The specimens are mostly fine, medium, and coarse in texture. The subsequent phase Period V shows a further increase in their record of worked stones specimens (n=54) along with adding up new shapes. The specimens from this deposit are mostly medium to coarse in textures. Likewise, the succeeding phase reported worked stones specimens (n=7) which are fine to coarse in texture (Tables 17 and 18; Figure 12).

A dimensional Study of Flat-worked Potsherds and Flat-worked Stones Reported in Vadnagar

Based on these inferences, flat-worked potsherds and flat-worked stones (medium and large-size) were to be used in the game of Hopscotch and Seven Stone. Hence, the main goal of this paper was to determine the regularity of different shapes by assessing the morphology of these artefacts, with an anticipation that some concept would be forthcoming.

To justify the utility of these artefacts, dimensions like diameter/width/length, breadth, and thickness have been studied in detail. The obtained inferences would differentiate artefacts specifically used for the game of Hopscotch and Seven Stones. Thus, two major parameters of each artefact are considered to differentiate their utility in the games. The fragmentary which did not imply any complete shape of the artefact were taken in for quantification but were not considered for the dimensional study (Tables 19 and 20).

Table 19 illustrate the diameter/width/length distribution and material distribution of the artefact assemblage reported from Vadnagar. A cumulative count of 2087 specimens (comprising plain pottery wares, decorated pottery and stone) were made under the range of 29.99 mm i.e. within 3 cm. Likewise, 1054 specimens were made under the range of 39.99 mm i.e. within 4 cm; 365 specimens were made under the range of 49.99 mm i.e. within 5 cm. It is observed that as the diameter/width/length range increases, there is a decline in the number of artefact production.

128 specimens were made under the range of 59.99 mm i.e. within 6cm, and 47 specimens were made under the range of 69.99 mm i.e. within 7 cm; 23 specimens were made under the range of 79.99 mm i.e. within 8 cm; 12 specimens were made under a range of 89.99mm i.e. within 9cm; 5 specimens were made under the range of 99.99 mm i.e. within 10 cm and single specimen each were made under the range of 109.99 mm i.e. within 11 cm and under the range of 119.99 mm i.e. within 12 cm respectively.

However, worked specimens made under the range of 29.99 mm to 49.99 mm dimensional range are suggested to be medium-sized artefacts. However, worked specimens made in the range of 59.99 mm to 119.99 mm are suggested to be large-sized artefacts. A cumulative count of 3143 specimens (comprising plain pottery, decorated pottery and stone) were made under the range of 9.99 mm i.e. within 1 cm; 540

specimens were made under the range of 19.99 mm i.e. within 2 cm; and 40 specimens were made the range of 29.99 mm i.e. within 3 cm.

Table 20: Thickness-wise and material-wise distribution of the artefact assemblage

Thickness (in mm) / **Material**	**0.00 – 9.99**	**10.00 – 19.99**	**20.00 – 29.99**	**Total**
Plain Pottery Wares	2910	475	36	**3421**
Decorated Pottery	173	18	2	**193**
Stone	60	47	2	**109**
Total	**3143**	**540**	**40**	**3723**

Figure 11: The geometric shapes identified in the cache of worked potsherds and a stack of worked potsherds

Figure 12: The geometric shapes identified in flat-worked stones

Suggestions and Inferences of Dimensional Study Supported by Comparative Archaeological and Contemporary Data

As referred by Mehta (1968), the medium-sized discs were known as *Paiya* in Gujarati, which certainly suggests its usage for the game of Hopscotch. However, he considered the comparatively large and crude-sized specimens to be used in a game known as *Satodiyun* in Gujarati, i.e. Seven Stones game known in English.

Eventually, according to contemporary data, the Seven Stone Game also known as '*Lagori*' is currently played using 8 to 9 slabs made of stone or plastic. These slabs have a diameter range from 39.99 mm to 84.00 mm and weights ranging from 34 to 45gm, respectively. The thickness range provided for each slab is 27.00 mm except for the top slab measuring 75.00 mm (Saxena, 2016).

Thus, keeping in mind comparative archaeological and contemporary data, it is suggested that medium-sized specimens with a diameter/width/length range of 29.99 mm to 49.99 mm (a total of n=3506 specimens) and with a thickness range of 0.99 mm (a total of n=3143 specimens) were used in Hopscotch game. It has been inferred that these medium-sized specimens with limited thickness were quite handy to throw on the ground marked with numbers or without numbers. With the limited thickness

range, it would help the artefact land properly in the desired compartments. Likewise, it is suggested that the cache of worked potsherds (n=115) falling almost within the dimension range mentioned above be used in the Hopscotch game.

Whereas, large-sized artefacts with a diameter/width/length range under 59.99 mm to 119.99 mm (a total of n=217 specimens) and with a thickness range from 19.99 mm to 29.99 mm (a total n= 580 specimens) were suggested to be used in the game of Seven Stone.

Likewise, it is suggested that the stack or pile of large worked potsherds (n=7) that fall within the dimension range mentioned above be used in the Seven Stone game (Figures 11 and 13).

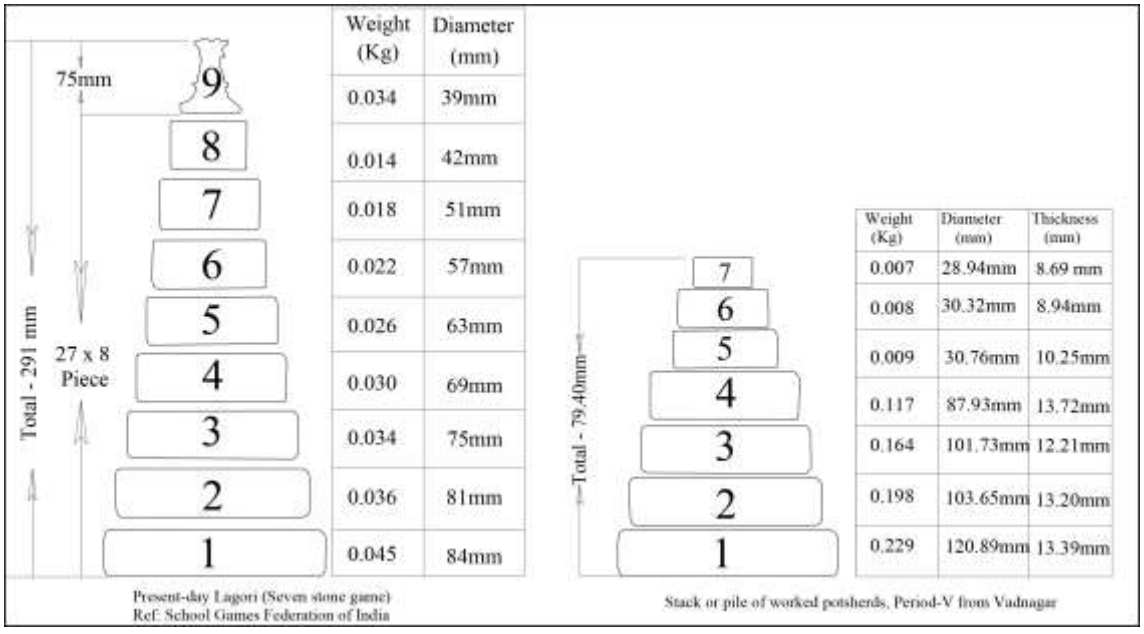

Figure 13: Comparison between the stack of worked potsherds reported from Vadnagar and present-day *Lagori* (Seven Stone game)

Provenance Associations

The excavations in Vadnagar were carried out in two localities, i.e., in Ambaghat (north-eastern side of Sharmistha Lake) and on the southern side of Ambaji Kotha Lake (near Anaj Godown). The former locality has residential structures i.e. habitational sites, whereas the latter locality is associated with Buddhism. Flat-worked potsherds and flat-worked stones (medium to large-sized) were found in open areas adjacent to the residential structures and sometimes inside the residential structures. Few of them were discovered near hearths or in places where burning activities took place at Ambaghat locality.

Table 21 revealed that a total of n=3941 flat-worked potsherds and flat-worked stones (medium to large-sized) have been employed since Period I continuing up to Period VII. Likewise, the presence at the southern side of Ambaji Kotha Lake is seen from

Period III continuing up to Period V. Considering data of both the localities, major production/occurrence/utilisation took place in Period IV followed by Period V.

Table 21: Locality-wise distribution of flat-worked potsherds and flat-worked stones in Vadnagar

Localities in Vadnagar	**Period**									**Talus Layers**	**Total**
	I	**II**	**III A**	**III B**	**IV A**	**IV B**	**V**	**VI**	**VII**		
Ambaghat locality	5	31	113	294	987	948	1017	384	50	112	**3941**
Southern side of Ambaji Kotha Lake	0	0	6	3	12	0	6	0	0	0	**27**
Total	**5**	**31**	**119**	**297**	**999**	**948**	**1023**	**384**	**50**	**112**	**3968**

Provenience and period-wise data specify patterns of association with habitational structures and religious structures. Certainly, games like Hopscotch and Seven Stones were confined to limited activity areas. This is evident through discoveries like the cache of worked potsherds (n=115) used in the Hopscotch game and the stack of worked potsherds (n=7) used in the Seven Stones game. These specimens were found nearby at the Ambaghat locality.

Determining the patterns of different shapes, revealed specific or popular shape association ratios between the assemblage among these two localities. Although a mixture of shapes was desired to be employed from the localities, the pentagonal-shaped specimens were most prevalent. This was followed by circular-shaped and hexagonal-shaped specimens.

Contemporary Accounts Mentioning Both the Games

Gupta (1943) writes, in brief, a game similar to hopscotch played in the Central Provinces under the name of *chikri billa/chikar billa* in Hindi (game piece should be round brickbats) and called *saka-bhata-khela* (the game of boiled rice and vegetables) in Bengali. *Chikri Billa* meaning round brickbats, consists of casting a round piece of brickbat or potsherd, jumping on one leg through a rectangular court drawn on the ground divided into six chambers and hopping on the potsherd and making one's scores in "rounds" on the ground by one's foot. This game is common in South India also and is called *pandi* in Tamil and *Trokkudu* (jumping on) *Billa* (a round piece) (Raghavan, 1943). "*Stapoo*" or hopscotch is considered to be a popular outdoor game in many states of India. In Tamil Nadu, it is famous by the name *Nondi*. Likewise, presently the *Pithu/Lagori* or Seven Stones game involves a rubber ball and a pile of seven flat stones stacked upon one another (Badiger 2020:1812-1814).

Conclusion

To conclude, the ubiquitously found, flat-grounded or worked potsherds and flat-worked stones were considered quite insignificant by archaeological researchers. Often

grouped with discs and sherds, the function or usage of these artefact assemblages was elusive. Hence, this paper aimed to establish a descriptive typology by determining the regularities in shapes, ceramics, and stones. By assessing the morphological characteristics, the concept of reusing raw material readily available in Vadnagar suggests their function in games like Hopscotch and Seven Stone. The thorough investigation of the dimensions of each artefact justified the utility purpose of each. The inferences obtained distinguish artefacts specifically used for the game of Hopscotch and Seven Stones. Classifying flat-worked potsherds and flat-worked stones (medium and large-size) by comparing their dimensions helped to understand the entity of each artefact without regard for any other.

The comparative archaeological and contemporary data provided strong support for the enigmatic history of both games. The sources helped in building a framework where factual evidence and modern-day data were correlated to create notions for forthcoming functions.

The precise representation of the game drawing or pattern can be traced back to the 17th century CE through Western contact. However, there are indications to suggest that different versions of this gaming pattern may have existed since the Harappan period, as corroborated by such archaeological findings.

To conclude, the social life of Vadnagar has changed a little. There is a continuity of ideas from the remotest past to modern times. But, an important factor to note is that the ideas and resources have changed now. Nevertheless, the material evidence found scattered in this archaeological context has certainly provided an interesting chapter of the social history of ancient Vadnagar.

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