

Vol. XXXIX, No. 1, 2014

# Man and Environment



Indian Society for Prehistoric and Quaternary Studies

## Typological Analysis of Chalcolithic Lithic Assemblage from Navinal, District Kachchh, Gujarat, Western India

Charusmita Gadekar,<sup>1</sup> S.V. Rajesh<sup>2</sup>, Saleem Shaikh<sup>3</sup>, Brad Chase<sup>4</sup>, Y.S. Rawat<sup>5</sup>, Ambika Patel<sup>6</sup>, G.S. Abhayan<sup>2</sup>, V. Vinod<sup>2</sup>, Ajit Kumar<sup>2</sup> and P. Ajithprasad<sup>1</sup>

1. Department of Archaeology and Ancient History, The Maharaja Sayajirao University of Baroda, Vadodara
2. Department of Archaeology, University of Kerala, Thiruvananthapuram, Kerala
3. Department of Archaeology, Krantiguru Shyamji Krishna Verma Kachchh University, Kachchh, Gujarat
4. Department of Anthropology and Sociology, Albion College, Michigan, USA.
5. Gujarat State Archaeology Department, Gandhinagar, Gujarat, India.
6. Department of Museology, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India.

### Abstract

Recent explorations at the site of Navinal, Kachchh District, Gujarat has brought to light interesting evidence regarding the co-existence of regional Chalcolithic culture with Urban Harappans. This integration is reflected in various archaeological artefacts collected from the site. Lithic assemblages are an integral part of Chalcolithic cultures and are known to provide important evidence regarding trade and technology. The lithic assemblage recovered from the site has given proof of long distance trade/contact and adaptation of a new technique of the lithic blade production.

### Introduction

The co-existence of Urban Harappans and Regional Chalcolithic cultures especially in the region of Gujarat has been the focus of many recent researches (Ajithprasad 2002, Madella *et al.* 2010, Ajithprasad 2011; Ajithprasad and Sonawane 2011; Rajesh 2012). Various archaeological artefacts collected from the coastal site of Navinal have produced interesting facts regarding interaction/trade/contact between these two material cultures. Results of a typological analysis of the lithic assemblage collected from the site have been presented in this paper. The study of lithics is of importance for understanding broader questions about society given that lithic assemblages are shaped by a social context that includes factors such as mobility, subsistence practices, craft activities, and other aspects of daily life (Raczek 2010). It was interpreted that the lithic assemblage provided important evidence regarding long distance contact/trade and continuation/incorporation of two distinct lithic technologies.

### Site

The archaeological site at Navinal (22° 49' 17.5" N, 69° 35' 49.9" E) in Mundra Taluka, Kachchh District, Gujarat (Fig. 1) was discovered by P.P. Pandya in 1950s, but was first reported by S. R. Rao in 1963 (Rao 1963). Assigned by S. R. Rao as a Rangpur IIB Phase, this site appeared as a rough circular mound (approximately 11 ha). Surface features of the site have been studied by archaeologists from M.S. University of Baroda, Kachchh University, University of Kerala and Albion College, USA in 2011, 2012 and 2013.

Explorations were conducted at the site recently under a newly launched project – 'Archaeological Excavation at Navinal in Mundra Taluka, District Kachchh and Exploration in Kachchh District, Gujarat. This long-term multidisciplinary international research project at the Harappan settlement of Navinal, Taluka Mundra, District Kachchh in Gujarat has been launched with twin objectives; to understand the level of integration which existed among the Regional Chalcolithic Cultures and Classical Harappans found at the site, and, to understand the economic production and inter regional interaction network that existed during

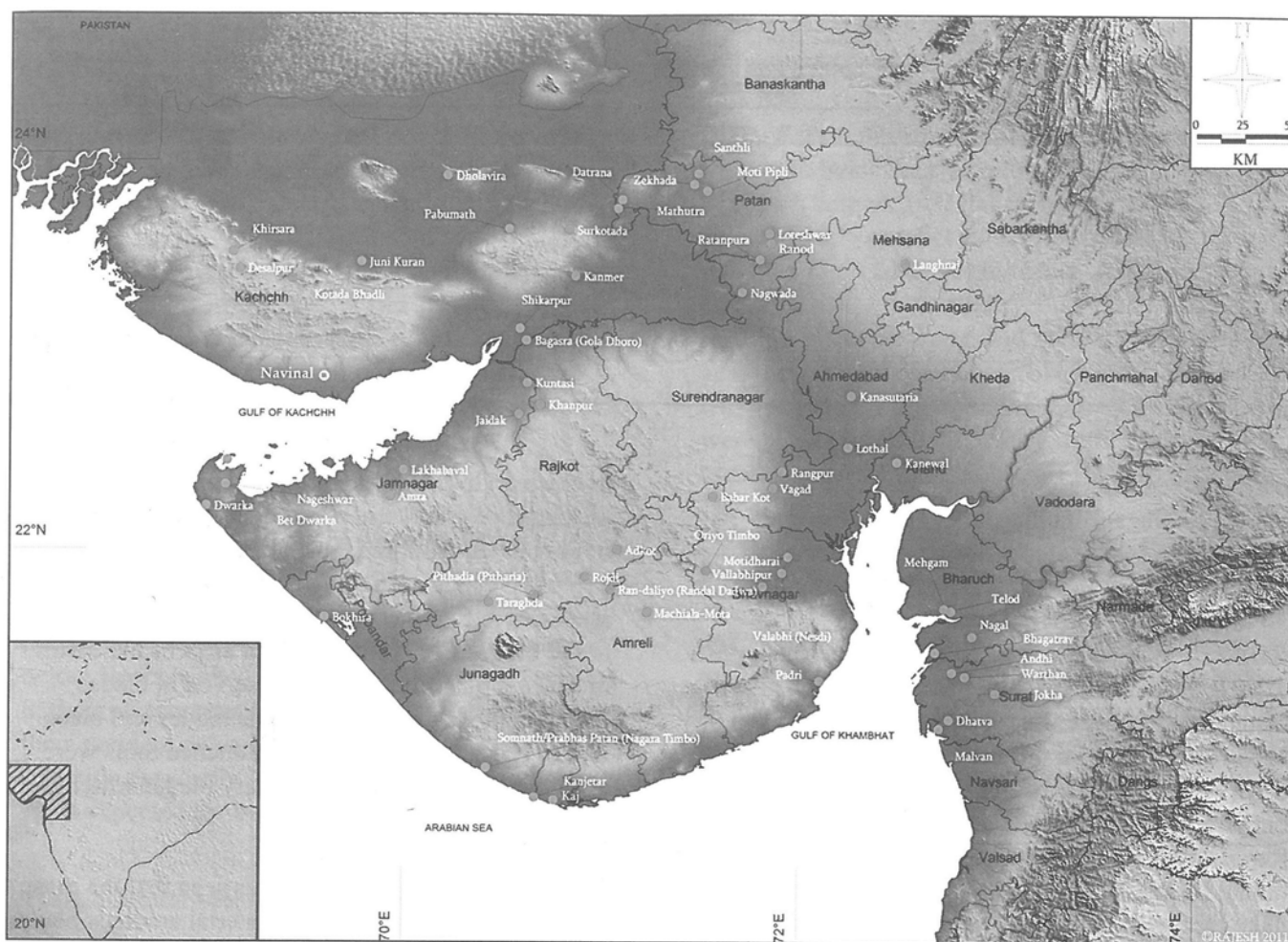


Fig. 1: Excavated Chalcolithic sites of Gujarat and location of Navinal

the Urban Harappan phase in Kachchh. The site is situated on the land allotted by the Government of Gujarat for SEZ thus the site is in danger of being destroyed. This project will serve to preserve the cultural materials of this endangered site, advance knowledge about the ancient Indus Civilization, and educate the general public and development officials regarding the importance of preserving this national heritage.

Study of surface finds has indicated remains of a ceramic assemblage belonging to the Sorath Harappan, Classical Harappan, Anarta Tradition and Late Sorath Harappan; terracotta objects such as – spindle whorls, pottery discs, hubbed wheels, toy cart frame; shell objects – net sinkers, perforated shell disc, bangle fragments, a small broken comb like object; varieties of beads (lapis lazuli, carnelian, agate, shell, steatite and terracotta); stone amulets, grinding stones, hammer stones and a large number of

copper tools. Many stone structural parts are visible at various parts of the mound. Evidence of various crafts activities can be seen on the surface of the site. Large amount of copper slag, copper nodules and a few crucible fragments indicate copper working. A number of exposed pottery kilns, large quantities of vitrified pot-sherds, kiln wasters and overfired pottery collected from the site show large scale pottery production. Cut collumellas, lip portions and debitage of *Turbinella pyrum* and *Chicoreus ramosus* shells indicate shell working at the site. A number of animal skeletal remains especially bones and teeth of cattle, sheep/goat and pig are also found from the site. Many of the bones show calcification suggesting substantial antiquity. Large number of charred and uncharred otoliths of a variety of fishes and fish vertebrae were also collected from the site. Huge quantity of complete and broken small shells (probably edible) and lithic debitage are found scattered all over the surface of the site.

**Table 1:** Classification of blades according to raw materials

| Blade Type               | Chert | Chalcedony | Banded agate | Moss agate | Total |
|--------------------------|-------|------------|--------------|------------|-------|
| Simple blades            | 3     | 27         | 4            | 1          | 35    |
| Backed blades            | 0     | 4          | 0            | 1          | 5     |
| Crested ridge blade      | 0     | 1          | 0            | 0          | 1     |
| Blade flakes             | 2     | 1          | 2            | 0          | 5     |
| Obliquely blunted blades | 0     | 2          | 0            | 0          | 2     |
| Total                    | 5     | 35         | 6            | 2          | 48    |

### Lithic Assemblage

Recent findings from the site of Navinal include 70 diagnostic tools (blades as well as geometric and non-geometric tools) and 789 fragments of lithic debitage.

**Blades:** a total of 48 blades, classified according to their attributes into simple blades, retouched blades, blade flakes and crested ridge blades have been recovered from the site (Table 1; Fig. 2). It was observed that simple blades (without any retouches but with edge damages) were maximum in number. Retouched blades (backed as well as obliquely blunted blades) constitute 14.59% , whereas blade flakes are represented at 10.42%. A single fragment

of crested guiding ridge blade provides evidence for the employment of this technique at the site. Most of the blades (40 fragments, 83.33%) were found in broken condition and majority of the fragments represent mesial pieces of a blade. Though 91.67% of the blades were found without any cortex, cortex in varying quantity has been observed in blades belonging to categories of simple blades and blade flakes. It was noticed that the retouched tools were exclusively made out of secondary blades which were devoid of cortex.

**Raw material exploitation:** it was seen that the most prominently represented raw material amongst blades


**Fig. 2:** Various blades and geometric tools from Navinal

was chalcedony (72.92%) followed by banded agate (12.5%), chert (10.42%) and moss agate (4.17%).

**Metric analysis: simple blades:** very little variation was found amongst the intact blades in their metric comparison. This is reflected in their low standard deviation values (Table 2). Broken blades, on the other hand, show a lot of variation in their lengths as well as their breadth values. It can also be seen that the breadth and thickness values in intact blades are much larger than in broken blades. This discrepancy, however, could be due to the small sample of intact blades.

**Backed blades:** backing has been done intentionally by chipping an edge of the blade to facilitate in-hafting, as well as to increase the amount of force that could be applied to the worked material (Andrefsky 2005). As can be seen from the table below, intact backed blades show very little variation in their measurements as reflected in low values of their standard deviation. Broken blades show high variation especially in their length and breadth values. As is expected the breadth values of backed blades

are much smaller than the breadth values of simple blades (Table 2).

**Blade flakes:** these are flakes which do not follow the length twice the size of breadth criteria of being a blade. These utilized flakes, however, have comparatively parallel sides and show a high variation in all their metric values. Again, this could be due to their small number. Four of these were found in intact condition and the result of their analysis is given below. One blade flake, however, was found in broken condition and its measurements were as following: 27.82 mm length, 24.06 mm breadth and 6.15 mm thickness (Table 2).

**Obliquely blunted blades:** also known as penknife blades. These blades have oblique retouches on one end. Neither shape nor the method of retouch gives any sign of their function, except that they most probably were hafted on the retouched or backed side. Or their angular end might have been used as a point. The possibility that these blades were hafted in wood, bone, or clay, is also indicated by their size (Sankalia 1967). Only two of such blades were found and their

Table 2: Measurements of blades and blade flakes (mm)

|                      | Measurements | Mean  | Median | Mode  | Std dev |
|----------------------|--------------|-------|--------|-------|---------|
| <b>Simple blades</b> |              |       |        |       |         |
| Intact blades        | Length       | 24.95 | 24.95  | 23.77 | 1.66    |
|                      | Breadth      | 12.95 | 12.95  | 12.84 | 0.16    |
|                      | Thickness    | 5.5   | 5.5    | 4.41  | 1.55    |
| Broken blades        | Length       | 16.38 | 16.09  | 12.15 | 6.14    |
|                      | Breadth      | 9.42  | 8.74   | 6.19  | 3.28    |
|                      | Thickness    | 2.84  | 2.66   | 1.08  | 1.02    |
| <b>backed blades</b> |              |       |        |       |         |
| Intact blades        | Length       | 14.86 | 14.86  | 14.72 | 0.2     |
|                      | Breadth      | 6.07  | 6.07   | 5.87  | 0.29    |
|                      | Thickness    | 2.1   | 2.1    | 1.55  | 0.78    |
| Broken blades        | Length       | 9.86  | 9.09   | 8.1   | 2.25    |
|                      | Breadth      | 5.37  | 4.88   | 4.55  | 1.15    |
|                      | Thickness    | 1.67  | 1.61   | 1.45  | 0.26    |
| <b>blade flakes</b>  |              |       |        |       |         |
| Intact blades        | Length       | 20.73 | 18.42  | 15.97 | 6.67    |
|                      | Breadth      | 15.96 | 15.08  | 13.24 | 3.18    |
|                      | Thickness    | 6.16  | 6.26   | 3.41  | 2.26    |

mean lengths are 10.5 mm, breadths 7.26 mm and thickness 2.22 mm.

**Crested guiding ridge blade:** this blade is the byproduct of crested guiding ridge technique. The technique includes preparation of the core by making a longitudinal crested ridge which facilitates in the removal of parallel-sided blades (Evans 1897). It has been noted that this was the preferred technique to manufacture blades in 2nd and 3rd millennium B.C. in South Asia (Sankalia 1982). Thus the discovery of this tiny blade fragment is very important for this site.

#### **Geometric and non-geometric tools**

Geometric and non-geometric tools are important category of tools during Mesolithic as well as Chalcolithic periods.

Amongst the geometric category only lunates were recovered from the site. In the non-geometric category tools such as points, burins, borers (Fig. 3) and different varieties of scrapers have been discovered (Table 3).

It was observed that chalcedony was the most preferred raw material amongst this category of tools. Chert, banded agate, moss agate and quartz were also exploited to manufacture different variety of geometric and non-geometric tools.

**Lunates:** Lunates have been hypothesized as being used as arrowheads and harpoon barbs (Sankalia 1967), projectile points as well as cutting tools (Andrefsky 2005), thus giving them a larger functional territory. The three lunates found from the site belong to different raw materials but their metric analysis shows that they are very similar in their sizes (Table 4).

**Points:** a total of 5 points were recovered from the site. All were found to be in intact condition. Their measurements (Table 4) show that these are very diverse in their sizes.

**Burins:** burin is a flake tool with a chisel edge that was produced by the removal of two flakes or spalls

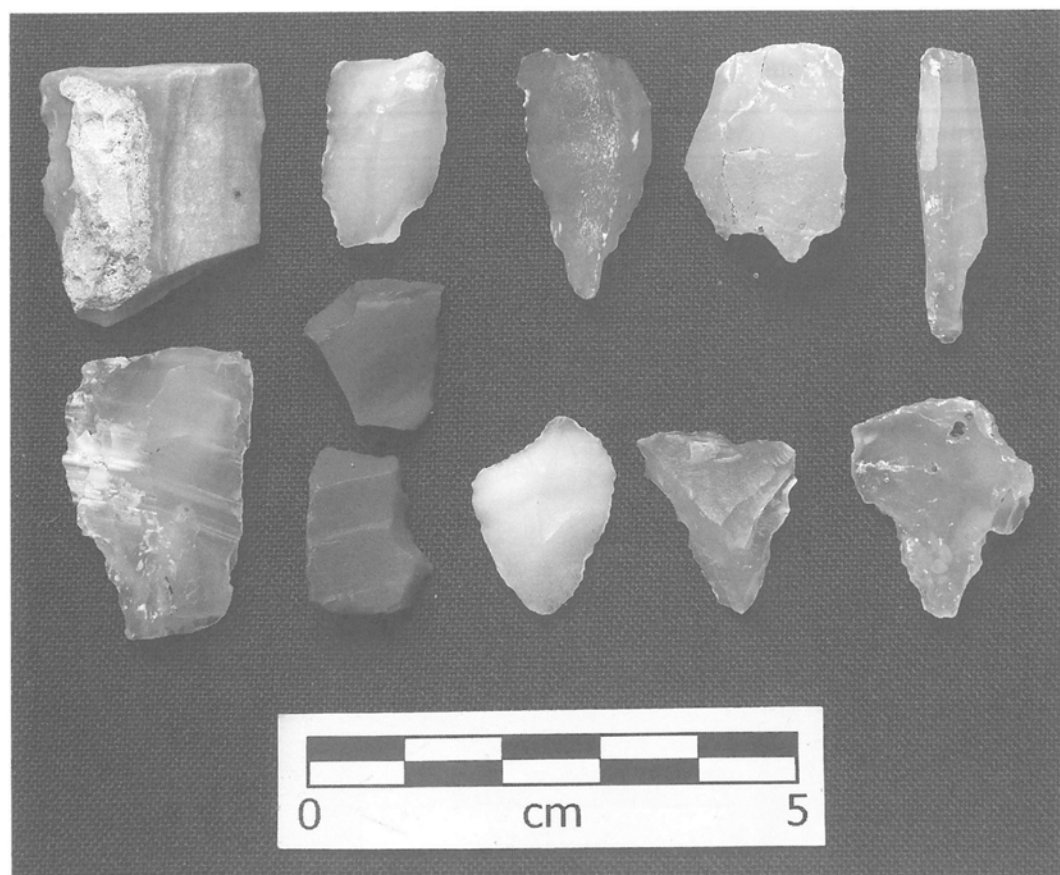


Fig. 3: Non-geometric tools from Navinal

**Table 3:** Classification of geometric and non-geometric tools according to raw material

| Tool Type             | Chert | Chalcedony | Banded agate | Moss agate | Quartz | Total |
|-----------------------|-------|------------|--------------|------------|--------|-------|
| Lunates               | 0     | 2          | 0            | 1          | 0      | 3     |
| Points                | 1     | 3          | 0            | 0          | 1      | 5     |
| Burins                | 0     | 1          | 1            | 0          | 0      | 2     |
| End scrapers          | 1     | 1          | 0            | 0          | 0      | 2     |
| Side scrapers         | 1     | 1          | 0            | 0          | 0      | 2     |
| Double sided scrapers | 1     | 1          | 0            | 0          | 0      | 2     |
| Concave scraper       | 1     | 0          | 0            | 0          | 0      | 1     |
| Side and end scrapers | 0     | 2          | 2            | 1          | 0      | 5     |
| Total                 | 5     | 11         | 3            | 2          | 1      | 22    |

**Table 4:** Measurements of lunates, points and burins (mm)

|         | Measurements | Mean  | Median | Mode  | Std dev |
|---------|--------------|-------|--------|-------|---------|
| Lunates | Length       | 16.51 | 16.52  | 15.84 | 0.67    |
|         | Breadth      | 6.55  | 6.66   | 5.54  | 0.96    |
|         | Thickness    | 2.14  | 2.3    | 1.72  | 0.36    |
| Points  | Length       | 19.81 | 19.6   | 10.8  | 5.83    |
|         | Breadth      | 11.98 | 13.97  | 19.31 | 6.51    |
|         | Thickness    | 5.03  | 6.03   | 1.82  | 2.17    |
| Burins  | Length       | 27.55 | 27.55  | 23.9  | 5.17    |
|         | Breadth      | 12.45 | 12.45  | 8.43  | 5.68    |
|         | Thickness    | 8.02  | 8.02   | 5.92  | 2.96    |

at the right angles to one another to create a very fine sharp and durable edge. These tools are believed to be engraving instruments or instruments used to chisel very hard material as a bone. It should be kept in mind that burins most probably were used for several other functions too. Burins are believed to be hafted to provide more leverage on the hard material being worked (Andrefsky 2005). Only 2 specimens in this category were recovered from the site. Both are in intact condition and have very different sizes (Table 4).

**Scrapers:** stone artefacts with a steep edge produced by removal of small flakes are usually called scrapers. These are mostly associated with transverse motions of scraping and graving. Scrapers, however, are multifunctional tools. Various ethno-

archaeological and experimental studies have shown that side scrapers were used for cutting, chopping, as projectiles and various combinations of these functions. End scrapers though mostly associated with hide working in Europe have been found to have been used for working hide, bone, wood and antler (Andrefsky 2005). Since experimental studies have not been done for this preliminary work hence, we would like to propose that most probably the scrapers were utilized for the afore mentioned way at the site of Navinal too.

By observing the secondary retouches on their edges the scrapers recovered from the site have been classified into end scrapers, side scrapers, double sided scrapers, side and end scraper and concave scrapers (Table 5; Fig. 4).

**Table 5:** Measurements of scrapers (mm)

|                              | Measurements | Mean  | Median | Mode  | Std dev |
|------------------------------|--------------|-------|--------|-------|---------|
| <b>End scrapers</b>          |              |       |        |       |         |
| Intact                       | Length       | 24.85 |        |       |         |
|                              | Breadth      | 36.37 |        |       |         |
|                              | Thickness    | 7.71  |        |       |         |
| Broken                       | Length       | 14.28 |        |       |         |
|                              | Breadth      | 15.34 |        |       |         |
|                              | Thickness    | 4.35  |        |       |         |
| <b>Side scrapers</b>         |              |       |        |       |         |
| Intact                       | Length       | 38.56 | 38.56  | 25.12 | 19.01   |
|                              | Breadth      | 27.14 | 27.14  | 17.33 | 13.88   |
|                              | Thickness    | 16.37 | 16.37  | 8.11  | 11.68   |
| <b>Double sided scraper</b>  |              |       |        |       |         |
| Intact                       | Length       | 29.88 |        | 28.57 | 1.85    |
|                              | Breadth      | 29.92 |        | 26.67 | 4.6     |
|                              | Thickness    | 7.67  |        | 6.36  | 1.86    |
| <b>Side and end scrapers</b> |              |       |        |       |         |
| Intact                       | Length       | 19.99 | 19.27  | 19.27 | 1.12    |
|                              | Breadth      | 17.35 | 16.65  | 12.79 | 4.95    |
|                              | Thickness    | 8.96  | 6.78   | 5.9   | 4.57    |
| Broken                       | Length       | 22.04 | 22.04  | 22.03 | 0.02    |
|                              | Breadth      | 20.12 | 20.12  | 17.01 | 4.41    |
|                              | Thickness    | 5.83  | 5.83   | 5.74  | 0.13    |

**End scrapers:** two specimens have been found of this category. One is intact while the other is broken. The intact scraper was made on a primary flake (showed <10% cortex on its dorsal side) while the broken scraper was made on a secondary flake.

**Side scraper:** two broken specimens have been classified to this category. They were a noticeable difference in size. Both the scrapers were made out of secondary flakes and thus were devoid of any amount of cortex.

**Double sided scrapers:** two examples belonging to this category have been found. Both were found in intact condition and do not vary much in their

measurement. Both the scrapers were made out of secondary flakes and thus were devoid of cortex.

**Concave scraper:** a single example of this scraper was found amongst the lithic tools. Its measurements are – length 36.77 mm, breadth 39.39 mm and thickness 13.19 mm. This scraper was also made on a secondary flake.

**Side and end scrapers:** five examples of this category were found, three of which evidenced intact condition while the other two were broken. One intact scraper showed <10% cortex on its dorsal side while all the other scrapers were found to be without any cortex. Intact scrapers had similar lengths but were extremely

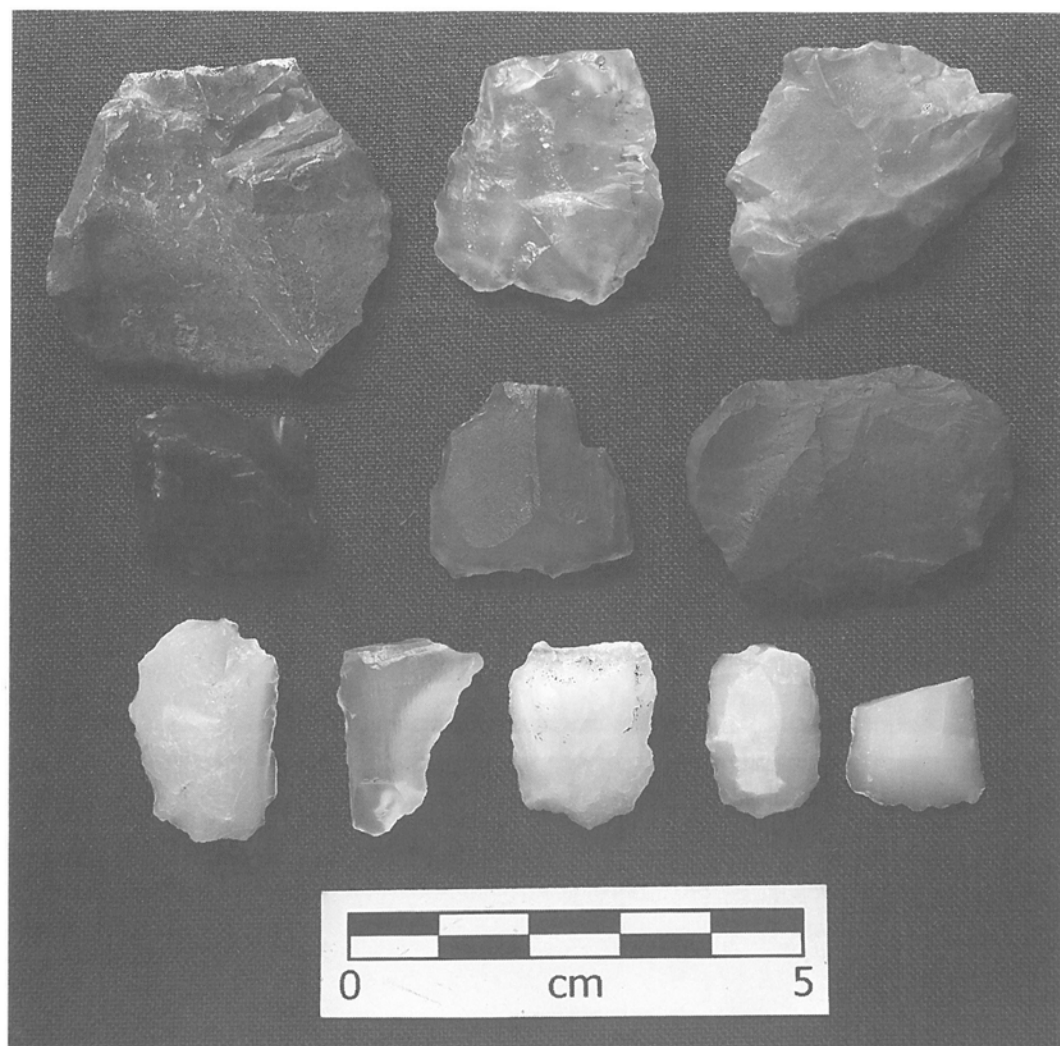


**Fig. 4:** Various types of scrapers from the site

varied in their breadth and thickness. Although, the broken scrapers showed uniformity in their lengths, but were found to be very diverse in their breadth values.

### **Lithic debitage**

Lithic debitage or the byproducts of stone tool productions from Navinal have been classified into flakes (primary, secondary and core rejuvenation), nodules, cores and waste/shatter. Three intact and a broken hammer stone were also found from the site.

Raw material exploitation: the most exploited raw material was chalcedony (32.43%) (Fig. 5) followed by chert (27.70%) (Fig. 6), banded agate (21.62%) (Fig. 7), quartz (8.78%) and moss agate (6.76%). It was further observed that lithic debitage included a few raw materials which were not represented in the either category of tools. These include

carnelian, sandstone, calcite and Rohri chert. Each is represented individually at 0.68%. Lithic assemblages recovered from sites such as Shikarpur (Bhan and Ajithprasad 2008), Khirsara (Nath 2012), Kanmer (Kharakwal *et al.* 2012), Bagasra (Gadekar 2006), Datrana (IAR 1993-94, 1994-95) and Pithad (IAR 1991-92) have also showed incorporation of similar types of raw materials. Other than Rohri chert (Biagi 1991), it has been found that these raw materials were either available locally or were accessible to the people through regional trade/contact (Law 2008).

**Flakes:** these have been classified into primary and secondary flakes according to the presence or absence of cortex from their dorsal surface. All the flakes were measured by placing them on a graph paper and noting the closest size category in centimetres.

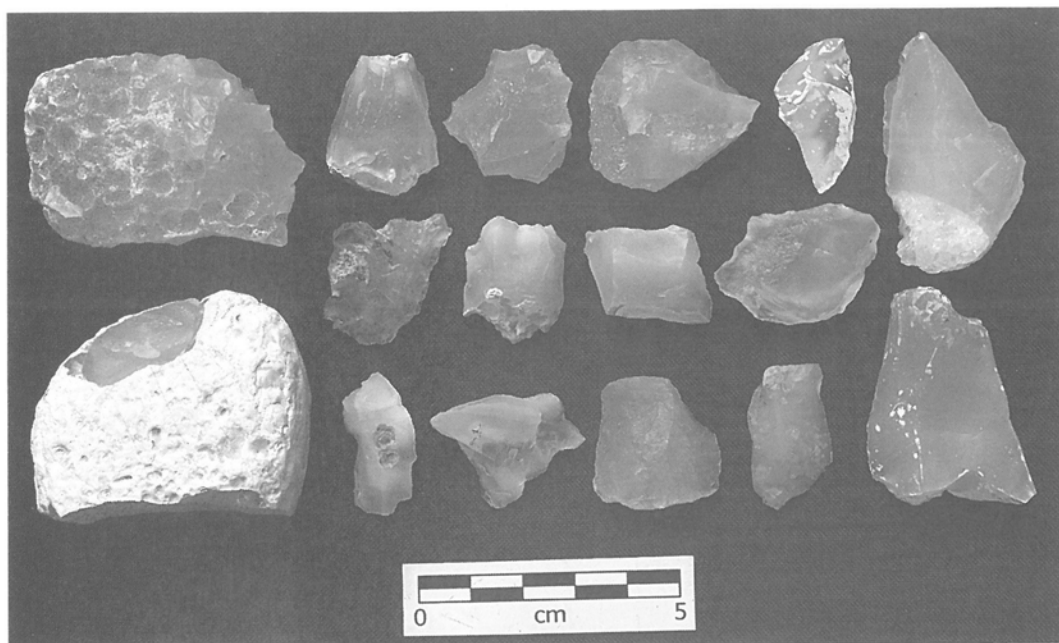


Fig. 5: Lithic debitage of Chalcedony

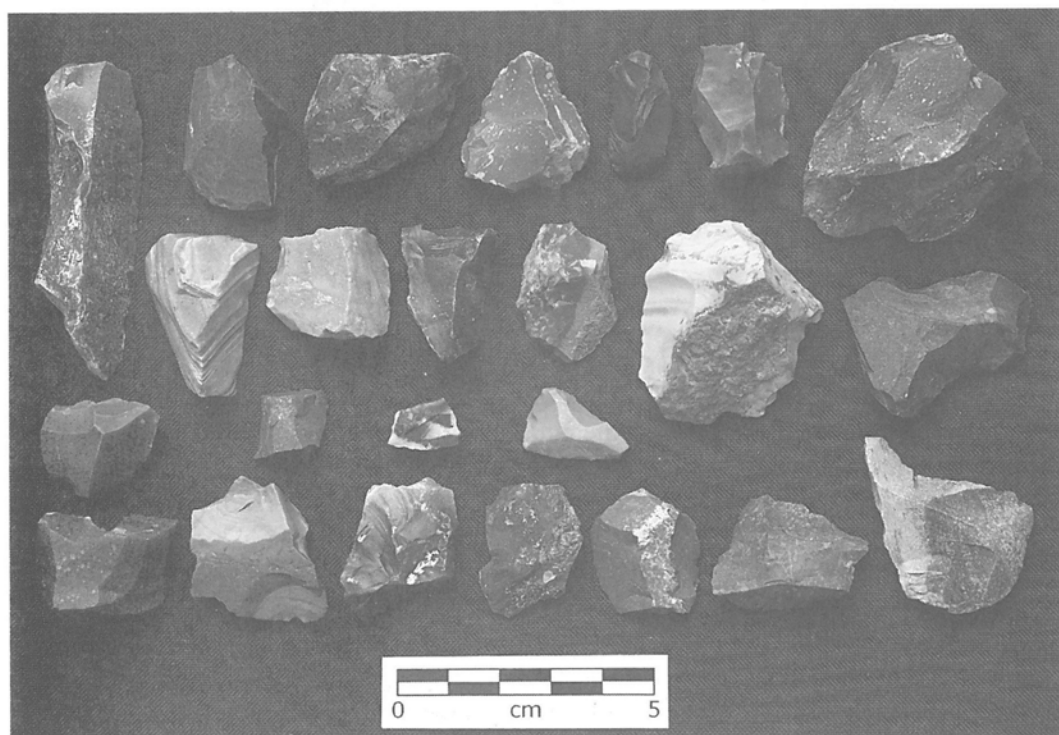


Fig. 6: Lithic debitage of chert

**Primary flakes:** these flakes are represented by raw materials – chert (17.85%), chalcedony (62.63%), banded agate (17.51%) and moss agate (2.02%). 93.6% flakes were found intact while 6.4% belong to the proximal fragments. Intact flakes were classified

into size categories of 0.5 cm (0.72%), 1cm (0.36%), 1.5 cm (15.83%), 2 cm (33.81%), 2.5 cm (16.19%), 3cm (15.83%), 3.5 cm (5.76%) and 4 cm (5.76%). The remaining 5.76% belong to the size 4.5 cm and above. It was observed that more flakes of a larger

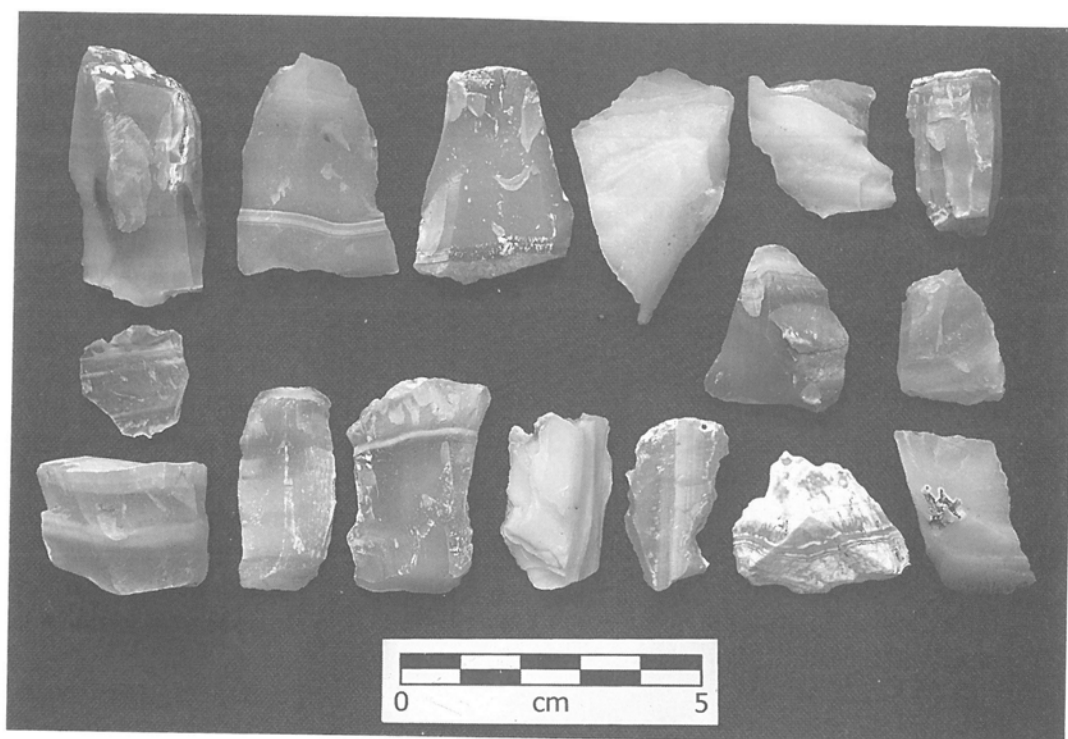


Fig. 7: Lithic debitage of banded agate

size were also found in this assemblage. Proximal fragments are represented by sizes 1 cm (10.53%), 1.5 cm (21.05%), 2 cm (36.84%), 2.5 cm (26.32%) and 4.5 cm (5.26%).

**Secondary flakes:** these flakes are represented by raw materials such as chert (27.91%), chalcedony (32.56%), banded agate (30.23%) and moss agate (9.3%). 75% flakes were found in intact condition and 25% flakes were represented by proximal fragments. Amongst the intact flakes only 6.5% were found to have been of size 4cm or more. 93.5% flakes were found to belong to the size categories of 0.5 cm (0.43%), 1 cm (5.19%), 1.5 cm (16.88%), 2 cm (28.57%), 3 cm (15.58%) and 3.5 cm (9.96%). proximal fragments of flakes were classified into the sizes 1cm (5.71%), 1.5 cm (51.43%), 2 cm (5.71%), 2.5 cm (25.71%), 3 cm (8.57%) and 5 cm (2.86%).

**Core rejuvenation flakes:** only two flakes of this category were found (intact - 2 cm, broken - 1 cm). Both are of chalcedony.

**Nodules:** 82 nodules belonging to different raw materials were recovered from the site. These have been classified into the categories of broken and randomly flaked (Table 6).

Table 6: Distribution of nodules according to their raw materials

| Raw Material | Broken | Flaked | Total |
|--------------|--------|--------|-------|
| Chert        | 0      | 2      | 2     |
| Chalcedony   | 9      | 7      | 16    |
| Banded agate | 11     | 0      | 11    |
| Quartz       | 6      | 36     | 42    |
| Calcite      | 11     | 0      | 11    |
| Total        | 37     | 45     | 82    |

**Cores:** The primary purpose of a core is to supply flakes that can then be used for the production of various tools (Andrefsky 2005). A total of 20 cores were found (15 - blade core category and 5 - flake core category).

**Blade cores:** blade cores of raw materials chert, chalcedony, banded agate, quartz and Rohri chert (Fig. 8) have been recovered from the site. The presence of Rohri chert core is very significant since it clearly points towards the possibility of a contact, either directly or indirectly, with the sites situated in Sindh region of Pakistan (Biagi 1991). This Rohri

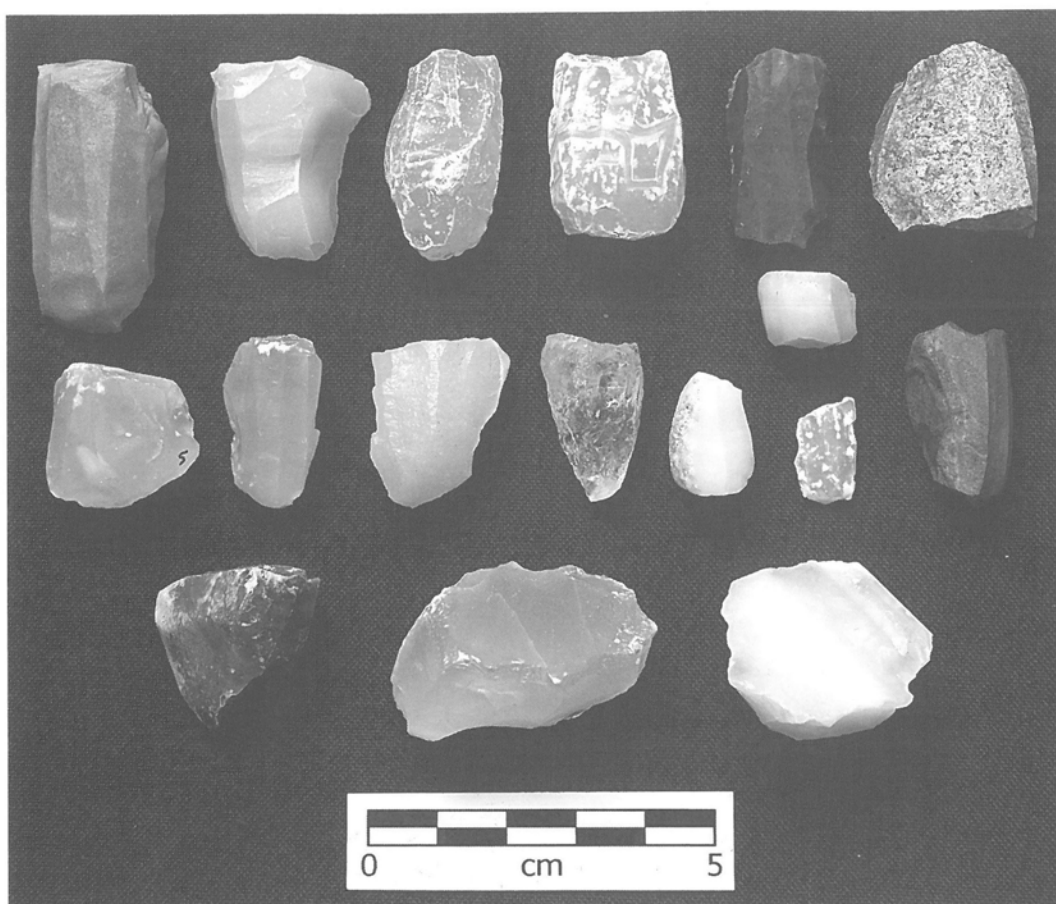


Fig. 8: Blade and flake cores from Navinal

chert blade core (Fig. 9) weighed 16.99 g (40.83 x 21.75 x 15.92 mm). Platform of this core was prepared by chipping. Blades were removed from one side giving it the shape of a cylinder. Finding of this core in isolation without the presence of any blades/tools of this particular raw material is puzzling and fascinating. Rohri chert blades form a ubiquitous part of Classical Harappan material culture but since they were manufactured in Sindh (Biagi 1991), lithic debitage including cores of this particular raw material are very rare from any other sites. Presence of this core at the site needs further investigation.

Blade cores have been classified into different shape categories such as conical (21.43%), cylindrical (57.14%), wedge (14.29%) and semi-conical (7.14%). It was observed that majority (78.57%) of the cores were unidirectional while 2 cores were bidirectional. In most cases (85.71%) core platforms were prepared by removing tiny flakes. Only in two cases the platforms were either not prepared at all or a single flake was removed to prepare it. This example of



Fig. 9: Rohri chert core recovered from the site

removal of a single flake could be due to the removal of the core rejuvenation flake and thus points towards utilization of a raw material to its maximum potential.

All the cores were measured using a Verniere caliper. Conical and semi-conical cores have been taken together in the metric analysis. Rohri chert core has been analyzed separately. Different types of blade cores vary a lot in their measurements (Table 7). By looking at the minimum values it can be clearly observed that these cores were utilized up to their maximum capacity.

**Flake cores:** flake cores belonging to chert, chalcedony and banded agate were recovered from the site. These have varying amount of cortex on their surface and flakes have been removed from them randomly. Their metric analysis (Table 7) shows that they differ a lot in their sizes.

**Blade manufacturing technique:** It was observed that two types of blade manufacturing techniques were being followed at the site. The presence of crested ridge blade fragment and the presence of an intact crested ridge on one of the blade cores (Fig. 10) clearly demonstrate that crested ridge technique was known to the occupants of this site. However, majority of the blade cores showed evidence of blade

removal only from one side and presence of cortex on the backside. Similar types of cores have been recovered from Pithad and this blade technology has been identified as quartering technique of blade manufacturing practiced specially during Mesolithic period (Ajithprasad 1992). Finding these two different types of cores suggests continuation of technological tradition as well as incorporation of new technique at the site.

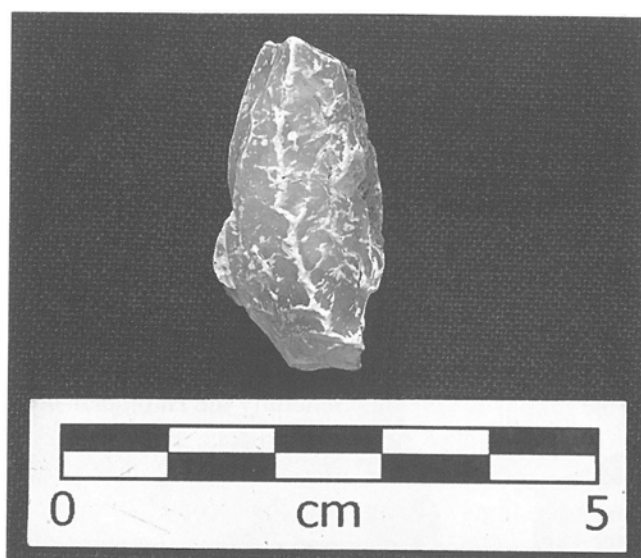


**Fig. 10:** Exhausted blade core showing intact crested ridge

**Table 7:** Measurements of blades and flake cores (mm)

|                              | Measurements | Mean  | Median | Mode  | Std dev | Minimum | Maximum |
|------------------------------|--------------|-------|--------|-------|---------|---------|---------|
| <b>Blade cores</b>           |              |       |        |       |         |         |         |
| Conical                      | Length       | 27.37 | 27.28  | 23.91 | 3.88    | 23.91   | 31.02   |
|                              | Breadth      | 19.48 | 19.45  | 14.83 | 3.98    | 14.83   | 24.21   |
|                              | Thickness    | 12.80 | 13.04  | 9.49  | 2.55    | 9.49    | 15.64   |
| Cylindrical                  | Length       | 23.95 | 26.28  | 14.84 | 5.45    | 14.84   | 28.75   |
|                              | Breadth      | 15.12 | 13.9   | 9.01  | 5.73    | 9.01    | 25.08   |
|                              | Thickness    | 12.87 | 12.44  | 3.92  | 4.8     | 3.92    | 19.38   |
| Wedge                        | Length       | 16.85 | 16.85  | 10.77 | 8.59    | 10.77   | 22.93   |
|                              | Breadth      | 18.29 | 18.29  | 13.47 | 6.82    | 13.47   | 23.12   |
|                              | Thickness    | 13.52 | 13.52  | 13.22 | 0.42    | 13.22   | 13.81   |
| <b>Amorphous Flake cores</b> |              |       |        |       |         |         |         |
|                              | Length       | 24.24 | 25.94  | 18.18 | 5.56    | 18.18   | 31.59   |
|                              | Breadth      | 33.91 | 29.94  | 18.33 | 14.18   | 18.33   | 56.71   |
|                              | Thickness    | 29.13 | 28.25  | 19.27 | 8.24    | 19.72   | 38.74   |

**Table 8:** Distribution of waste/shatter according to raw material and presence of cortex

| Raw Material | Absent | <10% | >50% | Total |
|--------------|--------|------|------|-------|
| Chert        | 16     | 0    | 1    | 17    |
| Chalcedony   | 45     | 1    | 28   | 74    |
| Banded agate | 10     | 6    | 0    | 16    |
| Moss agate   | 2      | 1    | 0    | 3     |
| Quartz       | 4      | 0    | 0    |       |
| Carnelian    | 0      | 0    | 1    | 1     |
| Total        | 77     | 8    | 30   | 115   |

**Waste/shatter:** Un-diagnostic flakes have been included in this category (Table 8).

### Conclusions

Chalcolithic cultural development is a complex issue in the region of Gujarat. Generally the Harappan sites in Gujarat are classified in accordance to the four-fold 'Rangpur sequence' proposed by S.R. Rao after the excavations at Rangpur in the second half of the 1950s (Rao 1963; Ajithprasad 2008). Commonly sites where Classical Harappan material culture is absent are classified as Sorath Harappan, and are found from Saurashtra region of Gujarat, thus the name Sorath. Subsequent researches in Kachchh, North Gujarat and South Gujarat however also showed its presence in these regions as well-often coincident with objects of Classical Harappan material culture.

The archaeological site at Navinal situated near the Gulf of Kachchh has shown evidence of ceramic assemblage, majority of which belongs to the Sorath Harappan and Late Sorath Harappan category, but at the same time has revealed Classical Harappan ceramics and Classical Harappan artefacts such as shell bangles with chevron marks, stone amulet, lapis lazuli bead and Rohri chert core. As at many other sites Gujarat, new research at Navinal shows clear evidence for a mixed material assemblage that includes artefacts attributed to each of these two categories. While this work is in its initial stages, it is consistent with findings from other recently excavated sites such as Bagasra, Shikarpur, and Kanmer where Sorath styles of pottery were used alongside pottery and other objects of Classical Harappan material culture (Sonawane *et al.* 2003; Bhan and Ajithprasad 2008; Kharakwal *et al.* 2012). At Navinal this is also

the case with the lithic artefacts.

The site has produced Rohri chert core, which is an important artefact and clearly points towards direct or indirect contact with the Sindh Region and the core area of Urban Harappans. The site has also exhibited crested guiding ridge blade and crested guiding ridge core. This technology was first practiced in Gujarat during Early Harappan period as evidenced at the site of Datrana, situated in North Gujarat (Gadekar *et al.* 2013). The chalcedony blades from Navinal seem to resemble the blades of Datrana. Navinal has also produced evidence of quartering technique of blade manufacturing which was first identified at the site of Pithad (Ajithprasad 1992), though in the Mesolithic strata. Since then it has been seen that these two types of blade manufacturing techniques co-existed at most of the Chalcolithic sites. The site has given evidence of geometric tools, especially lunates and the non-geometric tools, especially varieties of scrapers, both these tool types were also found in comparatively good quantity from the Chalcolithic level at Pithad. The lithic debitage corresponds with the tools and shows that the blade manufacturing was one of the important activities followed at the site. Thus the typological analysis of lithic assemblage recovered from Navinal while giving an overall impression of belonging to a lithic assemblage associated with Sorath Harappan sites gives clear evidences of Classical Harappan affiliations suggesting incorporation of two cultural traits and interregional interactions.

### Acknowledgements

We would like to especially thank the University of Kerala and the Archaeological Research and Conservation Program: India and Pakistan program (administered by the Center for South Asia at the University of Wisconsin-Madison) for research funding. Fieldwork was undertaken by all MA students (1st and 3rd semester), Renjinimol M.N. and Haseen Raja from the University of Kerala. It would not have been possible without the support of Sarpanch Mr. Gajendra Singh of Navinal village. We are also thankful to the people of Navinal for their kind hospitality.

### References

- Ajithprasad, P. 2002. The Pre-Harappan Cultures of Gujarat, in *Indian Archaeology in Retrospect, Volume II Protohistory – Archaeology of the Harappan Civilization* (S. Setter and R.

- Korisetter Eds.), pp. 129-158. New Delhi: Manohar.
- Ajithprasad, P. 1992. *Microlithic Blade Technique: A Case Study*, Paper presented at the Annual Conference of ISPQS, Dharwad.
- Ajithprasad, P. 2008. Jaidak (Pithad): A Sorath Harappan Site in Jamnagar District, Gujarat and its Architectural Features, in *Occasional Paper 4: Linguistics, Archaeology and the Human Past* (T. Osada and A. Uesugi Eds.), pp. 83-99. Kyoto: Research Institute for Humanity and Nature.
- Ajithprasad, P. 2011. Chalcolithic Cultural Patterns and the Early Harappan Interaction in Gujarat, Harvard Oriental Series, *Opera Minerva* 7: 11-40.
- Ajithprasad, P. and V.H. Sonawane 2011. The Harappa Culture in North Gujarat: a Regional Paradigm, in *Occasional Paper 12: Linguistics, Archaeology and the Human Past* (T. Osada and H. Endo Eds.), pp. 223-269. Kyoto: Research Institute for Humanity and Nature.
- Andrefsky, W.J. 2005. *Lithics: Macroscopic Approaches to Analysis*. Cambridge: Cambridge University Press.
- Bhan, K.K. and P. Ajithprasad 2008. *Excavations at Shikarpur 2007-2008: A Coastal Port and Craft Production Centre of the Indus Civilization in Kutch, India*. <http://www.harappa.com/goladhoru>.
- Biagi, P. and M. Cremaschi 1991. The Harappan Flint Quarries of the Rohri Hills (Sind-Pakistan), *Antiquity* 65(246): 97-102.
- Evans, J. 1897. *The Ancient Stone Implements, Weapons and Ornaments of Great Britain*. London: Longmans, Green and Co.
- Gadekar, C.S. 2006. *A Preliminary Study of the Harappan Blade and Flake Industry of Bagasra*. M.A. Dissertation. Vadodara: The Maharaja Sayajirao University of Baroda.
- Gadekar, C.S., P. Ajithprasad and M. Madella 2013. Crested Ridge Technique and Lithic Assemblage from Datrana, Gujarat, *Heritage: Journal of Multidisciplinary Studies in Archaeology* 1: 16-28.
- IAR: *Indian Archaeology – A Review*. New Delhi: Archaeological Survey of India.
- Kharakwal, J.S., Y.S. Rawat and T. Osada (Eds.) 2012. *Excavation at Kanmer 2005-06 – 2008-09, Kanmer Archaeological Research Project – An Indo-Japanese Collaboration*. Kyoto: Research Institute for Humanity and Nature.
- Gujarat State Department of Archaeology and Institute of Rajasthan Studies, JRN Rajasthan Vidyapeeth, Udaipur.
- Law, R.W. 2008. *Inter-Regional Interaction and Urbanism in the Ancient Indus Valley: A Geological Provenance Study of Harappa's Rock and Mineral Assemblage*. Ph.D. Dissertation. Madison: University of Wisconsin-Madison.
- Madella, M., P. Ajithprasad, C. Lancelotti, B. Rondelli, A. Balbo, C. French, D. Rodriguez, J.J. Garcia-Granero, V. Yannitto, S.V. Rajesh, C.S. Gadekar and I. Briz 2010. Social and Environment Transitions in Arid Zones: the North Gujarat Archaeological Project – NoGAP, *Antiquity* 84(325).
- Nath, J. 2012. Khirsara: An Important Harappan Post in Western Kachchh, *Itihas Darpan* 17(1): 58-69.
- Raczek, T.P. 2010. Contextualizing Gilund: A Comparative Analysis of Technology, The Gilund Project: Excavation in Regional Context, in *South Asian Archaeology 2007 - Special Session 2* (T. Raczek and V. Shinde Eds.), pp. 33-40. Oxford: Archaeo press.
- Rajesh, S.V. 2012. *A Comprehensive Study of the Regional Chalcolithic Cultures of Gujarat*. Ph.D. Dissertation. Vadodara: The Maharaja Sayajirao University of Baroda.
- Rao, S.R. 1963. Excavations at Rangpur and other Explorations in Gujarat, *Ancient India* 18-19: 1-207.
- Sankalia, H.D. 1967. The Socio-Economic Significance of the Lithic Blade Industry of Navdatoli, M.P., India, *Current Anthropology* 8(3): 262-268.
- Sankalia, H.D. 1982. *Stone Age Tools: Their Techniques, Names and Probable Functions*. Pune: Deccan College.
- Sonawane, V.S., P. Ajithprasad, K.K. Bhan, K. Krishnan, S. Prathapachandran, A. Majumdar, A. Patel, and J. Menon 2003. Excavations at Bagasra 1996-2003: A Preliminary Report, *Man and Environment* XXVIII(2): 21-50.