EXCAVATIONS AT TULJAPUR GARHI
1984-85

MEMOIRS OF THE
ARCHAEOLOGICAL SURVEY OF INDIA
NO. 95

EXCAVATIONS AT TULJAPUR GARHI 1984-85
(Vidarbha, Maharashtra)

B.P. BOPARDIKAR
With Contributions From
S.R. Walimbe, M.D. Kajale, P.K. Thomas, Bhaskar C. Deotare and Rajagopalan

PUBLISHED BY THE DIRECTOR GENERAL
ARCHAEOLOGICAL SURVEY OF INDIA
JANPATH, NEW DELHI
1996

PRICE : *Rs. 180.00*

PRINTED AT BENGAL OFFSET WORKS, 335, KHAJOOR ROAD, KAROL BAGH, NEW DELHI-110005

Acknowledgements

I am deeply beholden to our former Director General, M.S. Nagaraja Rao, who gave me not only an opportunity to excavate Tuljapur Garhi, but also gave me constant guidance and inspiration to finish the report within the minimum time. I am also grateful to the entire staff of the Excavations Branch-I of the Archaeological Survey of India, Nagpur. Special mention may be made of Sarvashri S.K. Lekhwani, D.K. Ambastha, K.Ismail, J.N. Gandhi, Mohinder Singh, P.M. Bhope, S.V. Sutaone, R.K. Roy, S.K. Mitra and Ms. Indira S. Pande. Photography was done by Shri M.U. Qureshi. Typing work was done by Shri N.K.S. Sharma.

This report includes appendices by Drs. S.R. Walimbe, M.D. Kajale, P.K. Thomas and B.C. Deotare of the Deccan College, Postgraduate and Research Institute, Pune, for which the author is thankful to them.

I am highly grateful to Dr Rajagopalan of Birbal Sahani Institute of Palaeobotany, Lucknow, for giving me carbon dating within a very short span.

Nagpur

B.P. BOPARDIKAR

CONTENTS

LIST OF PLATES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

It was in the year 1950, early farming culture of the Deccan was brought to light at Jorwe in Ahmednagar District of Maharashtra. The site was also excavated (1950-51) on a small scale by H.D. Sankalia and S.B. Deo[1] and it was labelled as 'Jorwe' culture after the type site. Further, it was placed in its proper stratigraphical horizon by the excavation at Nasik (1950-51)[2] and Nevasa (1954-56)[3]. Thereafter a large number of Chalcolithic sites were explored in the last two decades between the Krishna and the Tapi rivers.

One of the major and important sites among them is Daimabad on the Pravara basin, which was discovered by the author[4] as early as 1958. It was first excavated by M.N. Deshpande[5] (1958-59) and later by S.R. Rao[6] (1974-75) to ascertain cultural phases, who then recognised three occupational phases. Realising the importance of the site, subsequently large scale excavation was undertaken by S.A. Sali[7] for four seasons spanning from 1975-76 to 1978-79. The excavation carried out by Sali threw more light on both the cultural phases as well as cultural aspects of chalcolithic Daimabad. The revised cultural phases as recognised by him is as follows :

Phase I	:	The Savalda Culture
Phase II	:	The Late Harappan Culture
Phase III	:	The Daimabad Culture
Phase IV	:	The Malwa Culture
Phase V	:	The Jorwe Culture

Apart from exposing the structural remains and other cultural materials horizontally of all cultural phases, the importance of the site remains with the fact that for the first time three cultural

---

[1] H.D. Sankalia, S.B. Deo, *Report on the Excavations at Nasik and Jorwe, 1950-51* (1955).
[2] H.D. Sankalia, and S.B. Deo, *Report on the Excavation at Nasik and Jorwe, 1950-51* (1955). pp. 4-7.
[3] H.D. Sankalia, and S.B. Deo, *From Prehistory to History at Nevasa*, (1960).
[4] *Indian Archaeology - 1958-59 - A Review*, p. 15.
[5] *Ibid.*, p. 15-18.
[6] *Indian Archaeology - 1974-75 - A Review*, pp. 29-31.
[7] S.A. Sali, *Daimabad, 1976-79* (1986).

phases, i.e. Savalda culture (Phase I), Late Harappan culture (Phase II), and Daimabad culture (Phase III) were recognised stratigraphically prior to Malwa culture in the Deccan.

Recent large scale excavations at Inamgaon, District Pune, Maharashtra has thrown more light regarding Malwa and Jorwe culture, especially about their cultural and settlement pattern. The other sites in Tapi Valley like Prakash, Bahurupa and Savalda further confirm this. The site of Tuljapur Garhi, discovered by the author in 1965-66[8] on Purna, a tributary of Tapi, therefore shows itself as the eastern most out-post of territorial expansion of Jorwe culture in the upper Deccan at present.

Thus, it can be summarised that all the above said chalcolithic culture sites are borne by the black cotton soil which is having riverine basis.

It is essential to mention that in the Tapi valley, the characteristic chalcolithic site is Prakash, which falls in the same basin in view of the fact that the Purna is a tributary of Tapi. At Prakash[9] Malwa pottery obtained from Period IA is akin both in type and design with that of Red ware pottery of Phase A at Tuljapur Garhi. Moreover, one or two graffiti marks on the Red as well as Black-and-Red ware are also common at both the sites. Similarly, Jorwe ware from Prakash IB is comparable to IA and IB pottery of Tuljapur Garhi.

A. CHALCOLITHIC PROBLEM IN VIDARBHA

The Chalcolithic site of Tuljapur Garhi on river Purna, a tributary of Tapi, is the eastern most limit of Chalcolithic site in Maharashtra at present. So far, no Chalcolithic site found beyond the district Wardha and the Wainganga valley as the eastern most limit of vidarbha, but there is a large concentration of megalithic sites in this region[10]. There are few sporadic sites showing existence of megalithic remains at Ranjale, Tekwada in Khandesh and in the Central Deccan at Bhosari near Pune. The presence of painted pottery along with Black-and-Red and micaceous red ware found in the excavations at Kaundinyapura I, Paunar, Takalghat and Khapa[11] show that there was a close cultural contact between painted pottery tradition and megalithism in the Vidarbha. However, from the excavations at Tuljapur Garhi it is seen that typical Jorwe painted pottery and the one found at Kaundinyapura, Paunar, bore no identity either in fabric or type. Therefore, the purpose was to unfold the problem of cultural diversity and extension of the Chalcolithic culture in this part of Vidarbha. Aiming at this problem a preliminary excavation at Tuljapur Garhi was undertaken in the season 1984-85.

---

[8] *Indian Archaeology - 1965-66 — A Review*, p. 27

[9] B.K. Thapar, "Prakash, 1955; A Chalcolithic Settlement in Tapti Valley", *Ancient India*, no. 20 & 21 (1964 & 1965), pp. 1-67.

[10] M.G. Dikshit, *Excavation at Kaundinyapura* (1968) p. 27.

[11] S.B. Deo, *Excavations at Takalghat and Khapa*, Nagpur University (Nagapur, 1970), pp. 2-3.

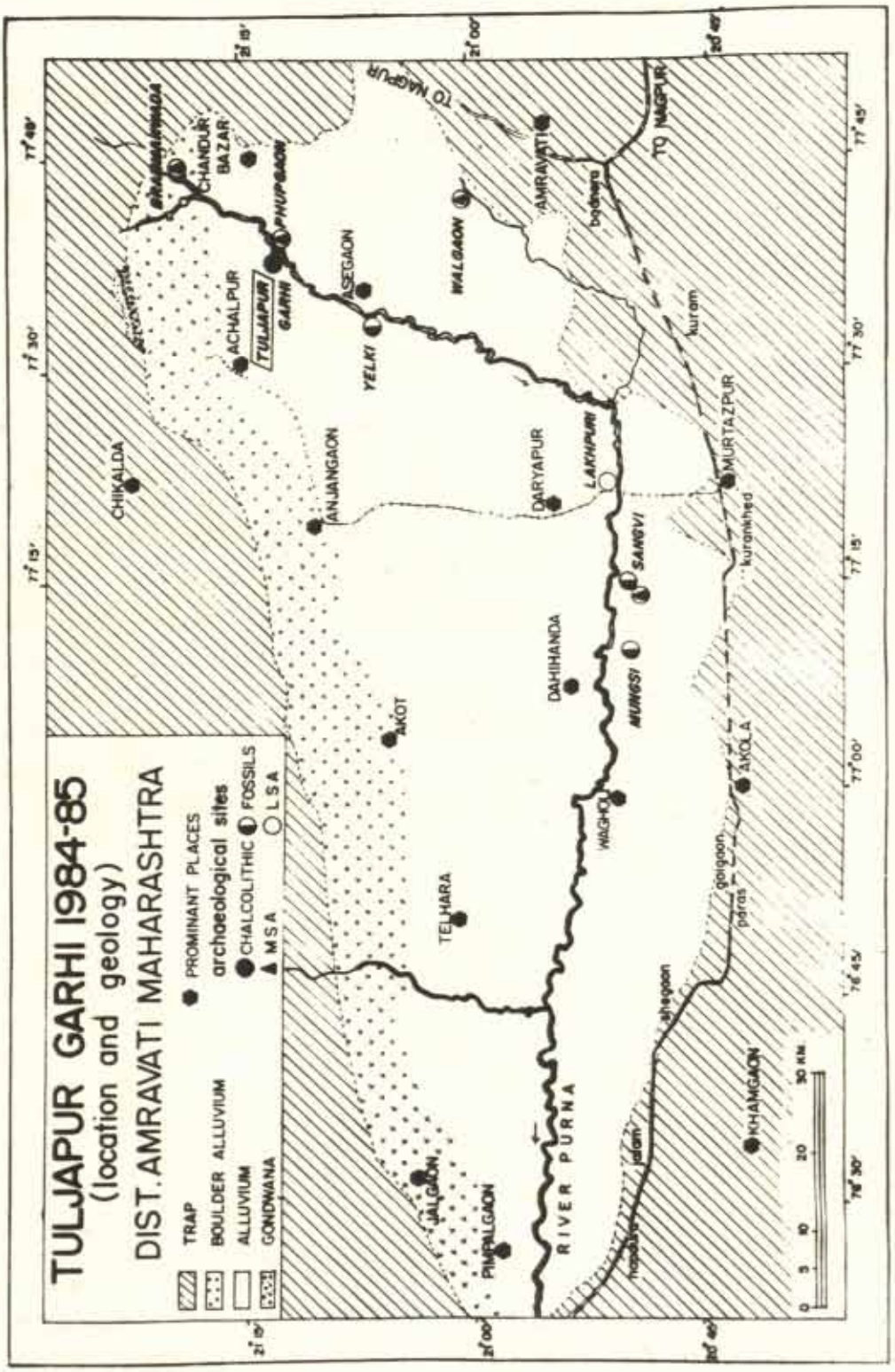

TULJAPUR GARHI 1984-85
(location and geology)
DIST. AMRAVATI MAHARASHTRA
TRAP
BOULDER ALLUVIUM
ALLUVIUM
GONDWANA
PROMINANT PLACES
archaeological sites
CHALCOLITHIC
FOSSILS
MSA
LSA
CHIKALDA
ANJANGAON
ACHALPUR
TULJAPUR GARHI
PHUPGAON
CHANDUR BAZAR
ASEGAON
YELKI
WALGAON
AMRAVATI
TO NAGPUR
DARYAPUR
LAKHNPURI
MURTAZPUR
kurum
AKOT
DAHIHANDA
SAWVI
KUNGSI
WAGHOLI
TELHARA
JALGAON
PIMPALGAON
RIVER PURNA
AKOLA
KHAMGAON
30 KMS

FIG. 1

B. GEOLOGY AND GEOMORPHOLOGY

The Geology of the Purna basin is comparatively very simple as it involves few rock formations, which differ in geological age. There are few isolated patches of Gondwanas, Lametas and Laterites occurring towards the north-eastern boundary of the Purna valley. The major geological formation in the area is of Deccan Trap and alluvium[12]. There is a faulting along the scarp to the north, north-east of Ellichpur and it runs along east-north-east to west-south-west with a considerable down throw of 609·76 metres towards the south.

C. LAND FORMS AND DRAINAGE SYSTEM

The concavo-convex shaped Purna Valley is about 160 km. in length and 48-56 km. in width, a faulted valley of late-Cretaceous to early Eocene age. Purna originates in the southern slopes of the Gawilgarh hills north of Brahmanwada. It is a major tributary of Tapi. After emerging from the hills it takes a southerly course from Brahmanwada, south-east of Daryapur, showing a remarkable sharp bend to the west almost at 120° and after flowing through the talukas of Amraoti, Akot and Jalgaon, it finally discharges in the Tapi near Changdev. The course of the river is mostly sinuous but the general trend remains straight, if these bends are ignored for general observation of the river course[13]. The morphology towards west shows, the characteristic features of a faulted region.

The Purna alluvium occupies a trough caused by the warping up of the underlying basaltic trap rock. Subsequent to or contemporaneous with the warping, a big fault occured along the northern edge of the trough, near the base of Satpura. The drainage on any geological formation is normally controlled by the lithological character and the structure of the underlying rocks. The Purna valley in this region underlain by the alluvium has maintained more or less a straight course. Thus the drainage displays the rectangular pattern, perhaps due to the superimposition (fig. 1).

---

[12] P.G. Adyalkar, "Palaeogeography, Nature and Pattern of Sedimentation and Ground Water Potentiality of the Purna Basin of Maharashtra", *Proceedings of the National Institute of Sciences of India*, Vol. 29, A, no. 1 (1963).

[13] R.V. Joshi and B.P. Bopardikar, "Drainage Pattern in the Purna Basin, Amraoti, Buldana Districts, Maharashtra", *Indian Science Congress*, 51st and 52nd Session, Part III (1965), p. 242.

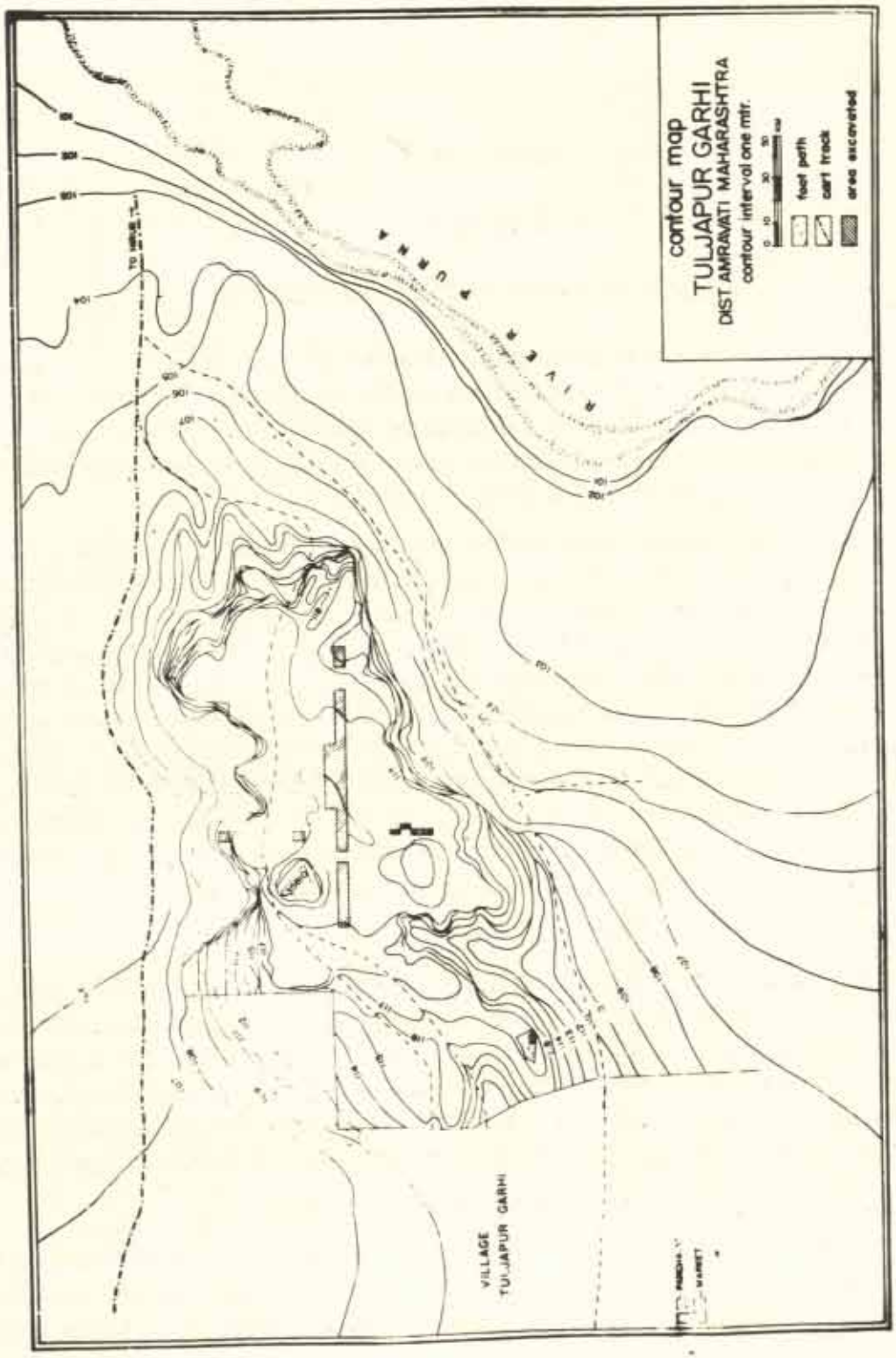

contour map
TULJAPUR GARHI
DIST AMRAVATI MAHARASHTRA
contour interval one mtr.
0 10 20 30 mtr
foot path
cart track
area excavated
RIVER PURNA
VILLAGE
TULJAPUR GARHI

FIG. 2

CHAPTER II

THE SITE

A. EXCAVATIONS AT TULJAPUR GARHI

Tuljapur Garhi, a village in Chandur Bazar Tahsil of the Amraoti District of Maharashtra State (Long. 77° 38' E; Lat. 21° 12' N-55 G/12) is situated in the right bank of Purna river, a major tributary of the Tapi (pl. I). The village is approachable from Amraoti railway station by State transport as there is a motorable road at a distance of 60 km. Amraoti railway station is on a loopline, from Badnera railway station which is on Bombay-Nagpur-Calcutta trunk route.

The ancient mound is situated to the south of the village on the right bank of Purna at a height of 320·12m contour (fig. 2), in the Gaothan area of the revenue limits of Tuljapur Garhi. The mound measures about 210 metres in length (north-south) and width 90 metres (east-west). It is about 20 metres high from the present bed level of Purna. The cultural deposit on black cotton soil is about 1·3m resting over the eroded surface, a deposit of silt, clay and gravel of Pleistocene period (pl. II). The central portion of the mound forms a trough. It was also observed that the other overlying cultural deposit on the black-soil i.e. Pandhari of early historical and muslim period has been eroded partly due to rain-wash and the rest is plundered by villagers for constructional and cultivation purposes subsequently. The traces of the same can be seen from the surface collections of pottery, muslim period coins and other antiquities. The black soil exposed on the top of the mound is of ilimited nature covering an area of about 90 × 70m in comparison to the vastness of the site.

B. THE CUTTINGS (LAYOUT)

Each trench measures 10 × 10m and is divided into four quadrants (pls. III-IV). In the north-south seven trenches and east-west four trenches were tapped. Mainly the cultural deposit was divided on the basis of occurence of Malwa-Jorwe ware, into two phases A and B. It is observed that there is overlapping of Malwa and Jorwe cultures. Five successive layers are demarcated on the basis of deposits. The layers (3) and (4) represent Phase A and the layers (1) and (2) represent Phase B. The layer (5) is of silt deposit which is natural soil over which the first human occupation started.

C. STRATIGRAPHY (fig. 3 pl. IX)

Layer (1) After the removal of humus of 0·05m, layer (1) is traced. The maximum thickness of it is 0·21 m and the minimum is 0·16m towards north-south. The maximum and the minimum deposit towards east and west is 0·12m and 0·08 m respectively. This layer contains loose yellowish

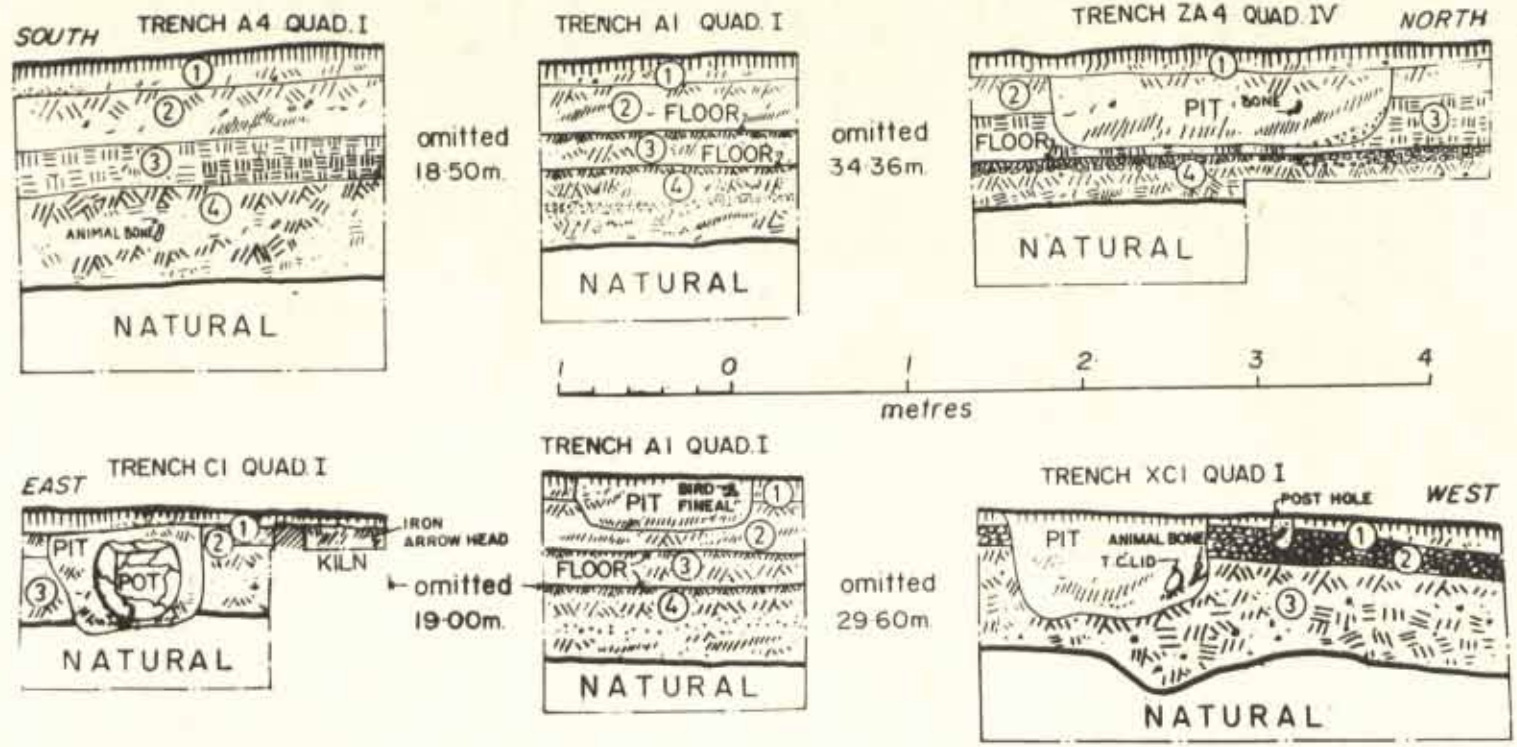

TULJAPUR GARHI 1984-85 DIST. AMRAOTI (MAHARASHTRA) SECTIONS
SOUTH
TRENCH A4 QUAD. I
ANIMAL BONE
NATURAL
omitted
18·50m.
TRENCH A1 QUAD. I
FLOOR
FLOOR
NATURAL
omitted
34·36m.
TRENCH ZA4 QUAD. IV
NORTH
PIT
BONE
FLOOR
NATURAL
1 0 1 2 3 4
metres
EAST
TRENCH C1 QUAD. I
PIT
POT
IRON ARROW HEAD
KILN
NATURAL
omitted
19·00m.
TRENCH A1 QUAD. I
PIT
BIRD FINEAL
FLOOR
NATURAL
omitted
29·60m.
TRENCH XC1 QUAD. I
POST HOLE
WEST
PIT
ANIMAL BONE
T CLID
NATURAL

FIG. 3

earth, sherds of Black-and-Red ware, greyish black ware, red ware and Jorwe ware, also associated with beads of semi-precious stone, terracotta beads, microliths and charcoal.

Layer (2) In the north-south direction the maximum and minimum deposit of this layer is 0·32m and 0·25m respectively and towards east-west 0·27m and 0·20m. The nature of this layer is comparably compact and the soil is yellowish grey. This layer contains few waste pits in which animal and fish bones along with pot-sherds are found. A good number of sherds of Jorwe ware, red ware, greyish black ware and Black-and-Red ware are found, which are associated with copper beads (micro), beads of semi-precious stones and terracotta beads and a solitary lid of bird finial in a shallow pit (fig. 7,25).

Layer (3) The maximum and minimum deposit of this layer towards north-south is 0·28m and 0·26m respectively. The colour of the soil is blackish (black cotton soil) and compact in nature. The layer contains pot-sherds of Malwa ware, red ware, Black-and-Red ware and greyish black ware and a few sherds of Jorwe ware along with bone pieces, beads of terracotta and semi-precious stones. But, so far, no copper object has been found.

Layer (4) This layer is partially dug in the control pit. The maximum deposit of this layer in north-south is 0.3m and in the east-west 0·58m. It is blackish compact soil with sherds of red ware, Malwa ware, meagre quantity of Black-and-red ware and greyish black ware. One terracotta bead is found from this layer and few beads of semi-precious stones are also recorded.

D. STRUCTURES (fig. 4; pl. VI)

House plan no. 1 (Trench ZA3, Qd. 1) : Circular with eight post-holes are traced. It is sealed by layer (2). The diameter of this house is 2·7m. The floor is rammed with clay and kankar. The depth of the post hole is about 0.1m. On the floor, bone pieces and pot-sherds are found *in-situ.*

House plan no. 2 (Trench A1, Qd. 1) : Oval in shape, having seven post-holes. The distance of one post hole to another ranges from 0·4m to 0·8m. The diameter of the house is approximately 2·4m. The floor of the house is rammed with black cotton soil mixed with kankar. An oven is also found on the plan. This floor is sealed by layer (2).

House plan no. 3 (Trench A4, Qd. 1) : Semi-circular in plan with a diameter of 2·5m sealed by layer (3). The floor is rammed with black soil. Five post holes are found on this floor. Three more post holes are also found in stray manner indicating attempt of reconstruction.

House plan no. 4 (Trench XC1, Qd. 1) : Three successive house-plans are noticed in this trench. The maximum and minimum diameter of the house plan is 2·95m and 1·35m respectively. This is almost circular in shape. The floor of the house is of rammed black soil and rubbles. On the surface of the floor bone pieces and pot-sherds are found.

E. KILN (pl. VII)

An almost circular kiln is noticed virtually on the surface, in the eastern side of the mound, in Trench C1, Qd. 1. The kiln measures 1·65m at its maximum diameter. A terracotta dabber

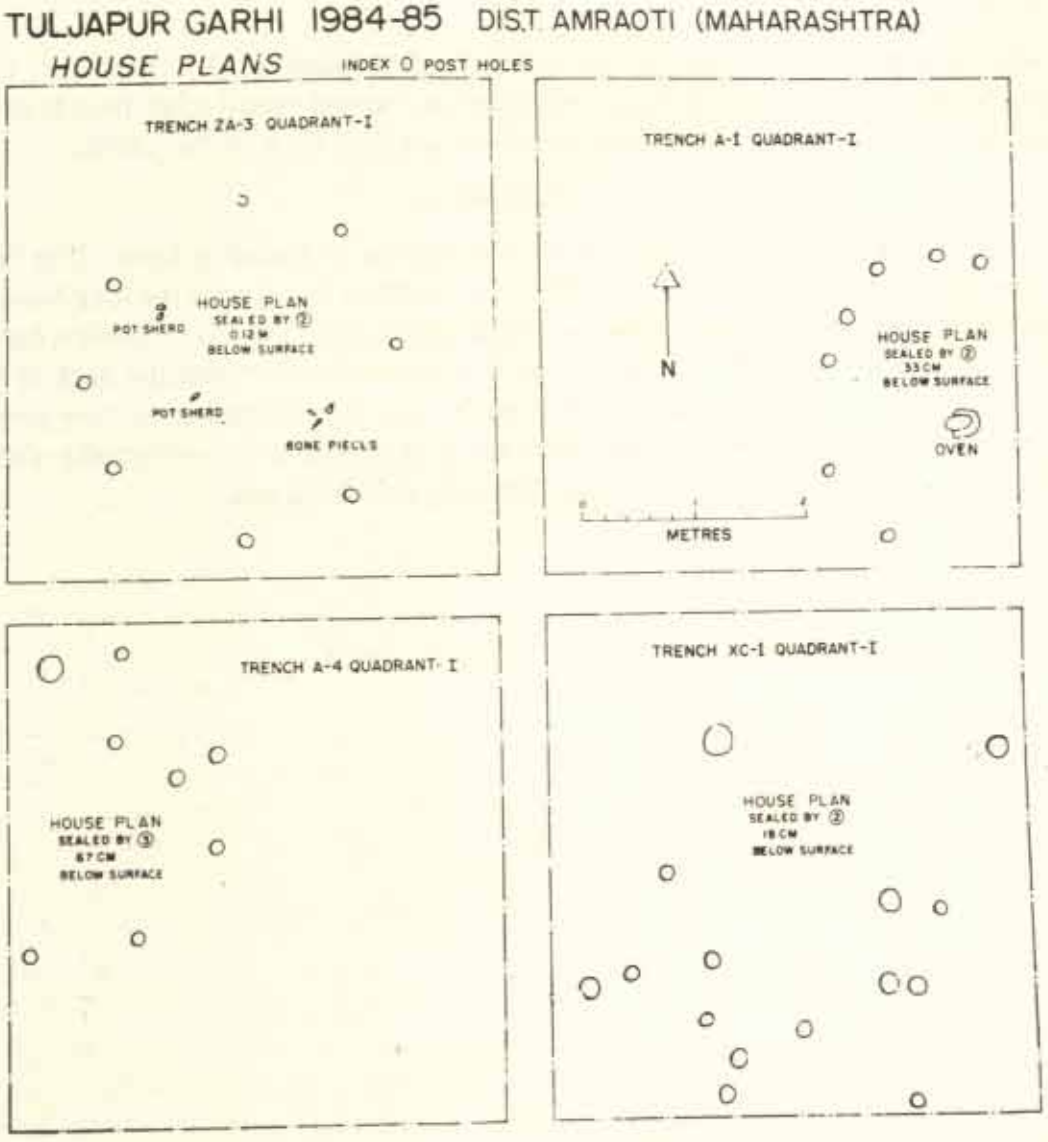

TULJAPUR GARHI 1984-85 DIST. AMRAOTI (MAHARASHTRA)
HOUSE PLANS
INDEX O POST HOLES
TRENCH ZA-3 QUADRANT-I
POT SHERD
HOUSE PLAN
SEALED BY ②
0.12 M
BELOW SURFACE
POT SHERD
BONE PIECES
TRENCH A-1 QUADRANT-I
N
HOUSE PLAN
SEALED BY ②
33 CM
BELOW SURFACE
OVEN
METRES
TRENCH A-4 QUADRANT- I
HOUSE PLAN
SEALED BY ③
67 CM
BELOW SURFACE
TRENCH XC-1 QUADRANT-I
HOUSE PLAN
SEALED BY ②
18 CM
BELOW SURFACE

FIG. 4

(pl. XIIIA) and a few painted sherds of Jorwe type are found. Out-let and in-let necessary for the kiln are also found.

In the deposit sealing this, an iron arrow-head is found (pl. V). Therefore, for the exact stratigraphical position of the structure, a conjecture may be made that it might have been made either by chalcolithic people or megalithic folk, who have left their trace on the surface.

F. BURIAL

A child burial (pl. VIII) is found in an oval shallow pit sealed by layer (2) in Tr A3, Qd. 3. The orientation of the burial is east-west. This is a stretched burial with the long bones, and skull towards east facing north. A solitary bowl of Black-and-Red ware is found with the burial as burial furniture. A necklace of eleven red jasper micro-beads is found around the neck of the child in disturbed condition and animal bones seen near the leg. The interesting feature here is that the orientation is not in north-south and the child burial is not found in urn as normally observed in the comparable chalcolithic sites in the Deccan. This may be a freak one.

CHAPTER III

POTTERY

Tuljapur Garhi is a uni-culture site, but on the basis of Malwa ware and Jorwe ware found in the excavations, it is divided into two sub-phases 'A' and 'B'. The pottery of this site falls into five major groups, i.e. (I) Black on red Malwa ware, (II) Black on red Jorwe ware, (III) Black-and-Red ware, (IV) Greyish black ware (slipped and unslipped), and (V) Red ware (slipped and unslipped). The entire range is wheel turned pottery except a few hand-made sherds of storage jars and big basins.

A. PHASE A: MALWA WARE

The characteristic pottery of this phase is black on red painted pottery (fig. 5) of Malwa fabric. It is wheel turned and treated with self slip. The slip ranges in colour from pale red to orange. Paintings are generally decorated over the slipped surface in black or in violet. Pottery texture varies from fine to medium fabric according to firing and further treatment. Mostly the designs are linear, wavy, horizontal bands, diagonal lines, zig-zag and ladder types. High necked vases with globular body, shallow dishes and deep bowls form familiar types.

B. PHASE B: JORWE WARE

This phase is distinguished by bulk occurrence of black on red painted pottery (fig. 6) of Jorwe ware. Technically, the assemblage is made on fast wheel, well fired, well slipped and mostly painted. It gives metallic sound because of well levigated clay fired to high temperature with no slag in the fabric. Types are thinner, compared to Malwa ware. Designs are painted either in black or violet on the red slipped surface. The painted designs comprise of zig-zag lines, multiple horizontal bands, wavy lines, group of diagonal lines in between two thick register. The most typical shapes include concavo-convex bowls, tubular spouted jars, and characteristic high-necked globular jars. The types in this ware are almost comparable to that of Prakash, Nevasa, Daimabad, and Chandoli (all in Maharashtra).

C. MISCELLANEOUS WARE

In the miscellaneous group, included are red ware (slipped and unslipped) (figs. 7 and 8) Black-and-Red ware (fig. 9:1-11) and greyish black ware (fig. 9,12-26) common throughout. This group is also wheel made. However, some jars and other big pots are hand-made. The fabric ranges from coarse to medium. Grit and husk are mixed in the clay for the preparation of the storage jars and other big pots as tempering materials. Most of these show use of wash of the same clay. Common types

in this ware include vases, storage jars, bowls, dishes, and basins or platters. Some sherds with bamboo impression are also (pl. XIV B) found. A base portion of a jar shows mat impression which is an interesting feature noticed here (pl. XIV A).

Among these, greyish black ware[1] shows an influence of ceramic activity of Malwa. They are all of medium fabirc and ill fired. This group generally are wheel made, slipped and burnished. Core is ill-fired having carbonaceous material. Ccmmon type in this category are bowls, dishes and a solitary lid (bird finial).

Black-and-Red ware has a meagre representation compared to other assemblage. They are of medium fabric, slipped, and well fired. The common types are shallow bowls, deep bowls, and basins. Some of the bowls show on their outside neck corrugation, probably as a feature of decoration. Besides these, few graffiti (pl. X) have also been noticed on Black-and-Red ware, red ware and black ware recovered from both Phase A and B.

Fig. 5

1. A bowl of buff and red ware, with a slightly incurved sharpened rim and convex sides. Interior painted in black, design indicating waves with intervals, ill-fired, well-slipped on both the sides, in different colours. Phase A.

2. A shallow bowl of red ware with a freatureless rim and slightly incurved sides. It is painted in violet over red, design appears to be 'plough', elsewhere it is also mentioned as 'comb' design. Phase A.

3. A shallow bowl with tappering sides, painted with a black band on exterior, well fired and slipped. Phase A.

4. A bowl with featureless incurved rim and globular body, painted in black with a thick slanting line and lower portion branched in two. Well fired and slipped. Phase A.

5. A bowl of red ware with a vertical featureless thickened rim and straight sides. It is painted in black with a horizontal band on the rim and slanting lines below a thick horizontal band on the shoulder. Well fired, well slipped. Phase A.

6. A bowl with everted sharp featureless rim painted in black horizontal band on the inside rim, and on the outside two thick horizontal bands. Phase A.

7. A bowl painted in black horizontal band on the inside rim, and on the outside horizontal band with diagonal lines having parallel short strokes looking like a ladder design over the neck, well fired, well slipped. Phase A.

8. A vase with slightly straight featureless rim with out-turned neck, painted in black over red on the neck with parallel horizontal bands, enclosing two oblique thin bands, well fired, well slipped. Phase A.

---

[1] H.D. Sankalia, B. Subbarao and S.B. Deo, *Excavation at Maheshwar and Navdatoli — 1952-53* (1958), p. 115.

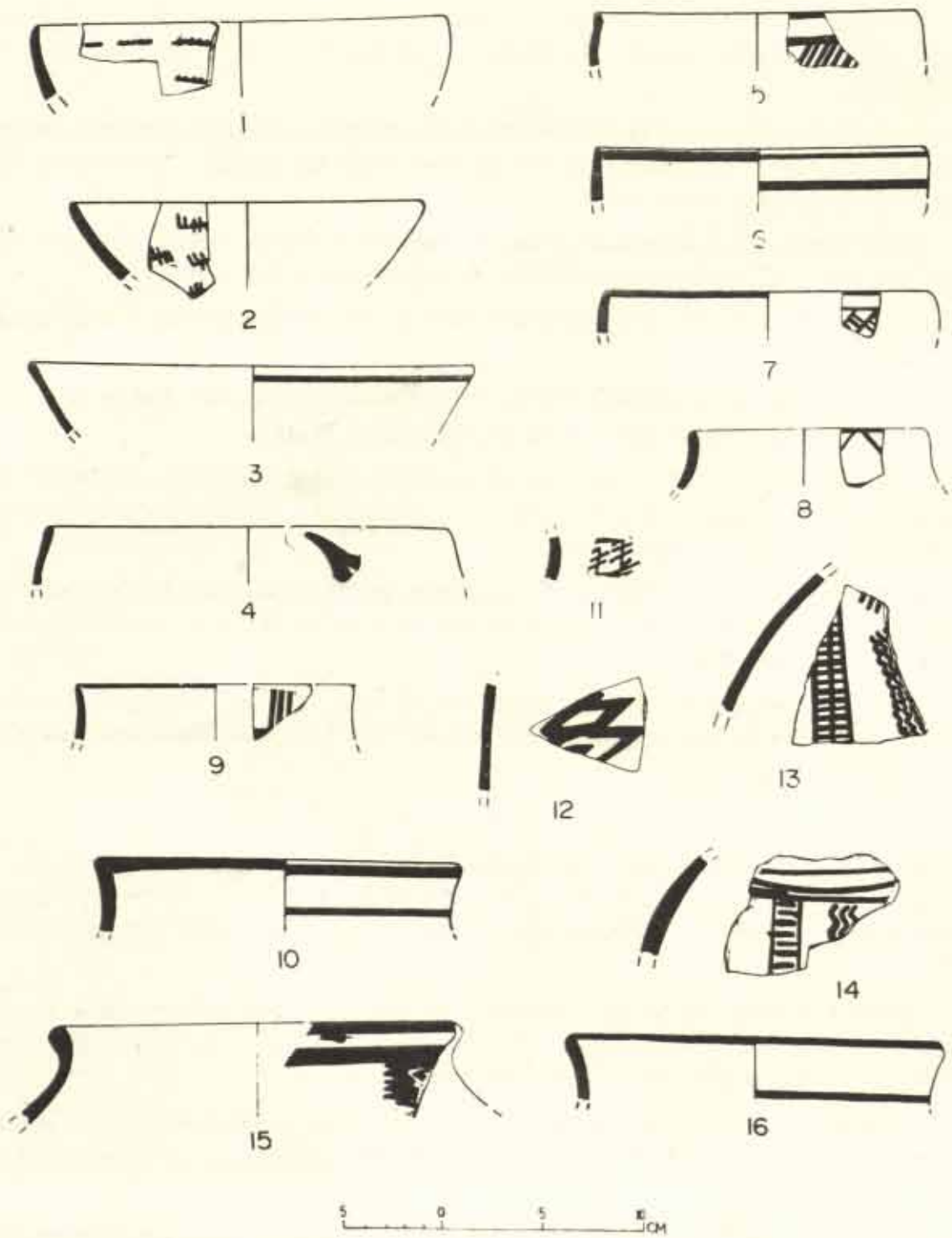


FIG. 5 : *Malwa Red Ware*

9. A bowl of red ware with a sharpened vertical rim and concave sides. It is painted on the exterior in black, with three vertical lines probably with two horizontal bands, well fired, well slipped. Phase A.

10. A vase with thick everted featureless rim and constricted neck, painted in black horizontal bands on both sides of the rim, similar parallel horizontal bands are painted on the exterior side of the neck. Well fired, well slipped. Phase A.

11. Aneck portion of a vessel painted in black over red with two horizontal bands between which there is a pair of two "Z" designs with internally parallel horizontal bands. Phase A.

12. A shoulder portion of a vase, painted in black with stylised zig-zag pattern, well fired, well slipped. Phase A.

13. A belly portion of a jar, painted externally in black over red, having ladder design, vertical three wavy lines and three small strokes at the broken portion. Phase A.

14. A belly portion of a vase of red ware painted externally in black with a ladder and three vertical wavy lines indicating "snake" below three horizontal bands, the centre of which is slightly curved. Painted over dull red wash. Phase A.

15. A storage jar with everted beaded rim, constricted neck, bulbous body. Painted outside with black register of two horizontal thick bands on the rim and neck, and thick zig-zag vertical design. Well fired, well slipped. Phase A.

16. A neck of a vase with thickened out turned featureless rim, painted in black on light red, with thick horizontal band on both the sides of the rim followed with thinner horizontal band on the neck. Well fired, slipless. Phase A.

Fig. 6

1. A typical convex sided bowl with slightly everted snubbed rim, indicating flat base. Rim painted on both sides in black on red horizontal bands. On the exterior side of the body there is a horizontal band inter-connected triangular shaped wavy lines, ill fired, well slipped, fast wheel. Phase B.

2. A bowl with an almost straight featureless rim, painted in black on both sides with a thick horizontal band on the internal surface of the rim and thin horizontal band over external rim and body. Three diagonal broken parallel lines, well slipped, ill fired. Phase B.

3. A globular bowl with a short clubbed rim. Painted in black on exterior with a pair of broken loops over a thick horizontal band and interior surface of the rim shows a partial horizontal band. Well slipped and well fired. Phase B.

4. A bowl with slightly everted beaded rim, painted on both sides, black on red, designed both sides of the rim with horizontal band. On the outside, a broken thick zig-zag design connected to thick horizontal band. Well fired, well slipped, fast wheel, striation marks visible. Phase B.

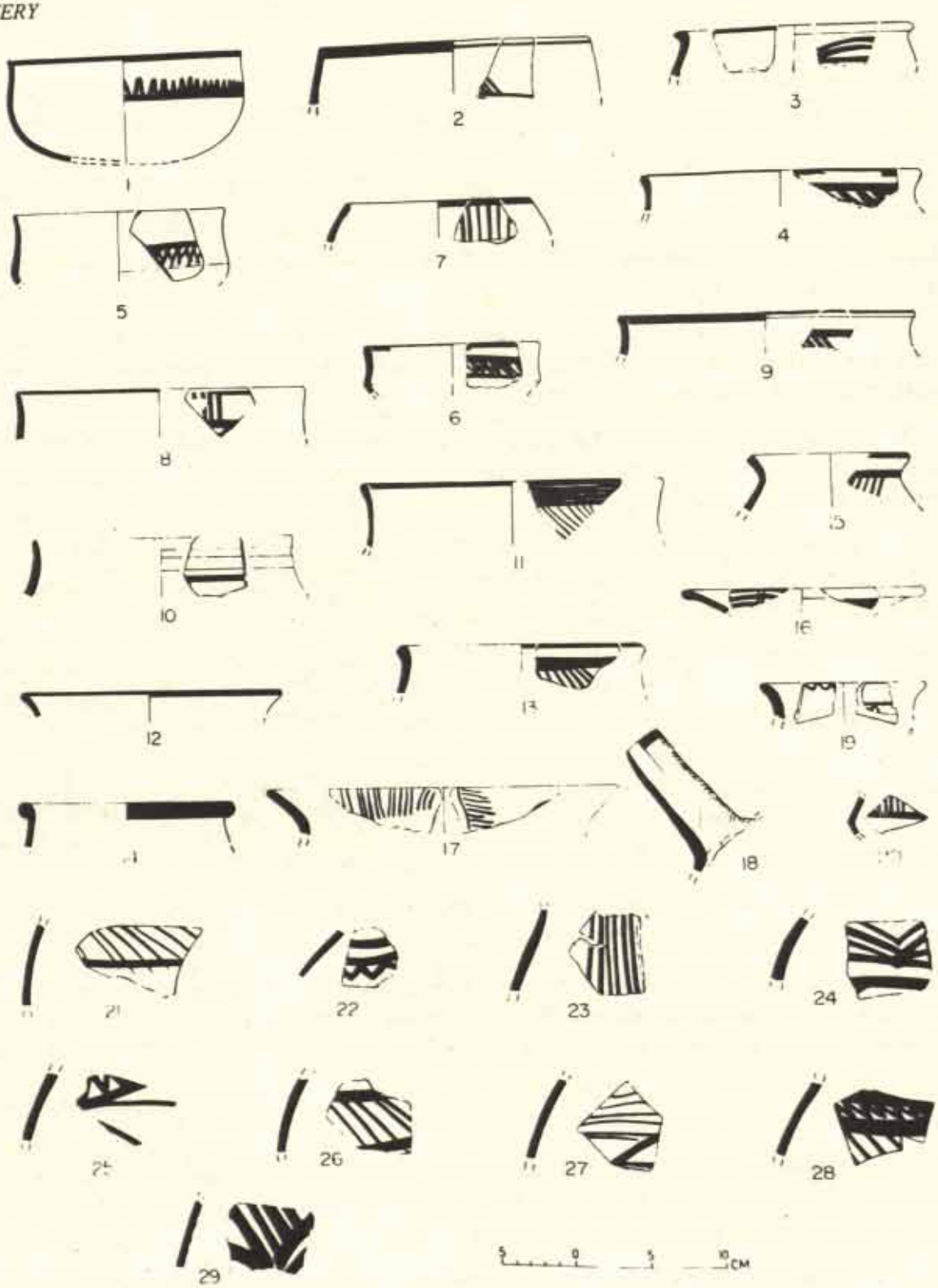


Fig. 6 : *Jorwe Red Ware*

5. A typical carinated bowl painted on the outside over tanned red slip in crimson paint. Design is between two horizontal bands four diagonal lines with good intervals, ill fired, well slipped. Phase B.

6. A carinated bowl, broken at the carination with slightly everted thickened featureless rim, painted on both sides, black on red. Internal rim with thin band and unfinished thickened band. Externally, rim has thick horizontal band, neck having a pair of horizontal bands enclosing thick zig-zag design, ill fired, slipped. Phase B.

7. A bowl with a slender slightly incurved rim with convex body made on fast wheel. Painted on the outside from rim to body. Design is a group of six vertical lines coming from the horizontal bands; weathered, well fired, well slipped. Phase B.

8. A thin bowl with everted featureless rim and convex body. Painted in black on red on both sides. Internal rim has horizontal band, externally between two horizontal bands there is a group of four vertical lines, slip peeled-off, weathered, well slipped, well fired, phase B.

9. A bowl with out-turned, beaded ledged rim, painted on both sides. Black on red internal band, external rim with a thin horizontal band over it. Outside neck has thick horizontal band having broken loops, ill fired, well slipped, fast wheel. Phase B.

10. A wide mouthed vase, with convex body, extended shoulder, everted featureless rim. Outside neck having three corrugations and greyish slip due to ill firing, painted in deep black on the outside neck with horizontal band, weathered, ill fired and slipped. Phase B.

11. A vase with a slightly everted beaded rim with a long convex neck. Painted on both sides in black over red, internally rim is painted with black band, externally rim and neck portion is having three thin horizontal lines in between two thick horizontal bands. From the horizontal band of the neck, seven diagonal lines in black are seen, weathered. Phase B.

12. A vase with a out-turned beaded rim. Painted black on red. Horizontal bands are on both sides of the rim, ill fired, well slipped. Phase B.

13. A bowl with an out-turned beaded rim and oblique sides. Painted over the rim with a black broad band. Outer side has six oblique lines below a black border. The interesting feature is red-tan slip applied inside, well fired, well slipped. Phase B.

14. A vase with beaded rim. Painted in black on both sides of the rim, well slipped, well fired. Phase B.

15. A bulbous vase with out-turned beaded rim, constricted neck, painted on outside. A black thick horizontal band on neck on outside. A black thick horizontal band, on neck with a group of four diagonal lines, well fired, well slipped, phase B.

16. A platter with a flared rim. Painted on interior with three parallel bands cut with two vertical lines, and a horizontal band (broken), well fired, well slipped. Phase B.

17. A vase with a flared rim. Painted in black both sides of the rim, on exterior, groups of vertical lines and on interior groups of horizontal lines, well slipped, well fired. Phase B.

18. A tubular spout of a jar. Painted in black with a thick vertical line and a horizontal band on the spout. Ill fired, slipped, weathered. Phase B.

19. A typical Malwa type narrow mouthed bowl with everted featureless rim. Painted on both sides, crimson on orange. Internal rim is having wavy lines. Externally below horizontal band there is loop design, well fired, well-slipped, highly weathered. Phase B.

20. A sherd of a miniature carinated bowl, broken at the carination, painted black on red. Design on the outside is horizontal band with a group of four vertical lines, ill fired, well slipped. Phase B.

21. A painted sherd, black on red, having horizontal band with seven diagonal irregular lines, well fired, slipped. Phase B.

22. A shoulder portion of a vase, painted in violet with loops below two horizontal bands, Well fired, well slipped. Phase B.

23. A reconstructed thick sherd having black on red painting. Design is a group of six vertical lines. Well fired, well slipped, inside surface showing lime incrustation. Phase B.

24. A thick sherd of a jar painted on the outside over the weathered red slip in black. Design is broken group of wavy loops in group of three over two registers of horizontal bands with intervals. Inside unslipped, ill fired. Phase B.

25. A thick painted sherd, black on red with micaceous surface. The complicated design hints a horizontal band having wavy lines on top and big loops below it. Ill fired, slipped, Phase B.

26. A painted sherd with fine diagonal lines in between two horizontal register in crimson over red, weathered, ill-fired, well slipped. Phase B.

27. A painted sherd of a jar, in tan red over dull red slip. Design of six oblique strokes over a horizontal thick band below which is a thick diagonal line unslipped inside, ill fired. Phase B.

28. A painted sherd with black on red painting on the outside, design is thick concentric bands, containing zig-zag line on the top and three diagonal lines below, well fired, unslipped inside, fast wheel. Phase B.

29. A shoulder portion of a vase corrugated inside. Painted in black with disturbed leaf pattern, well fired, well slipped. Phase B.

Fig. 7

1. A deep dish with featureless everted sharpened rim and converging body, ill-fired, slip on both sides, weathered. Phase A.

2. A wide mouthed bowl with thickened clubbed rim, convex body, well slipped and well fired. Phase A.

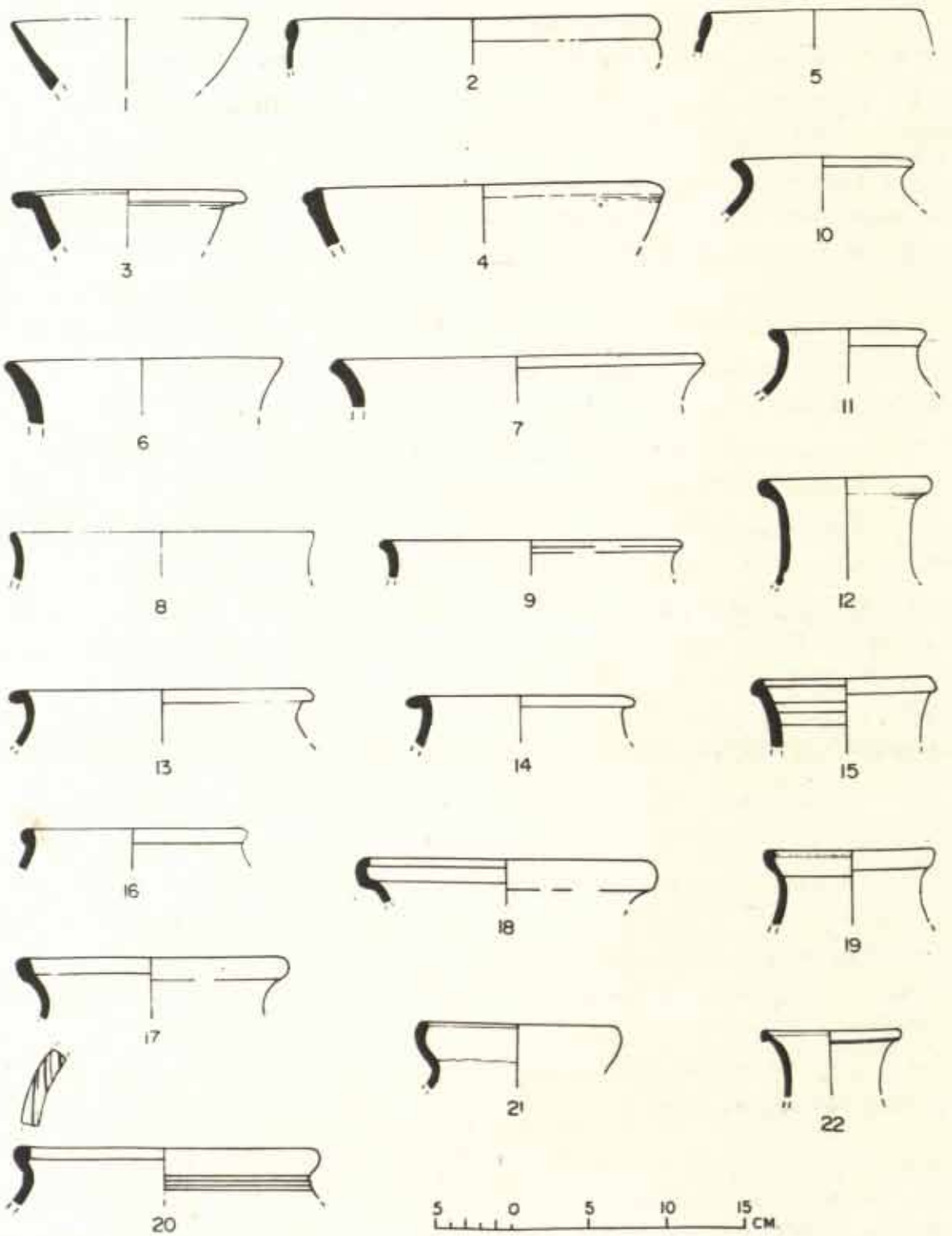


FIG. 7 : *Associated Red Ware*

3. A vase with splayed out and grooved rim, well fired, well slipped. Phase A.

4. A trough with a thickened flat rim having straight sides and grooved on the external side of the rim, ill fired, brownish red slip on both sides. Phase B.

5. A convex-sided bowl with sharp straight exterior flanged rim, well fired and well slipped. Phase B.

6. A medium thick neck of a jar with everted featureless rim. Constricted neck, ill fired, red wash on outside, untreated inside. Phase A.

7. A vase with an everted thickened flat rim having provision for a lid. Both sides well slipped, ill fired Phase A.

8. A vase with an out-turned featureless rim, constricted neck, both sides red wash, ill-fired. Phase A.

9. A vase with out-turned thickened rim probably with a long concave neck. Well fired, slipped. Phase A.

10. A jar with constricted neck, everted blunt rim with red wash on both sides, ill fired. Phase A.

11. A high necked jar with out-turned beaded rim having provision for lid. Concave neck, ill-fired, ill-slipped. Phase A.

12. A typical high necked jar with out-turned beaded rim, nail grooved below the outer surface of the rim. Well-fired, well-slipped. Phase B.

13. A high necked jar with out-turned beaded flat rim, constricted neck, bulbous body, provision for lid, ill-fired, grey slip on both sides. Phase A.

14. A vase externally beaded and under-cut rim, short concave neck and oblique shoulder. Ill-fired, slipped. Phase A.

15. A high necked jar with beaded rim. Corrugated inside neck. Well slipped and well fired. Phase B.

16. A '*handi*' with an out-turned beaded rim short concave neck. Well-slipped, well-fired. Phase A.

17. A typical red ware jar with clubbed rim having an internal groove and space for lid. Ill-fired. Phase B.

18. A polished basin with incurved beaded rim, having deliberate concavity inside the rim, ill-fired. Phase B.

19. A high necked vase with an out-turned beaded rim and a depression below the rim, mild grooves on the exterior side of the rim. Well-fired, slipped. Phase B.

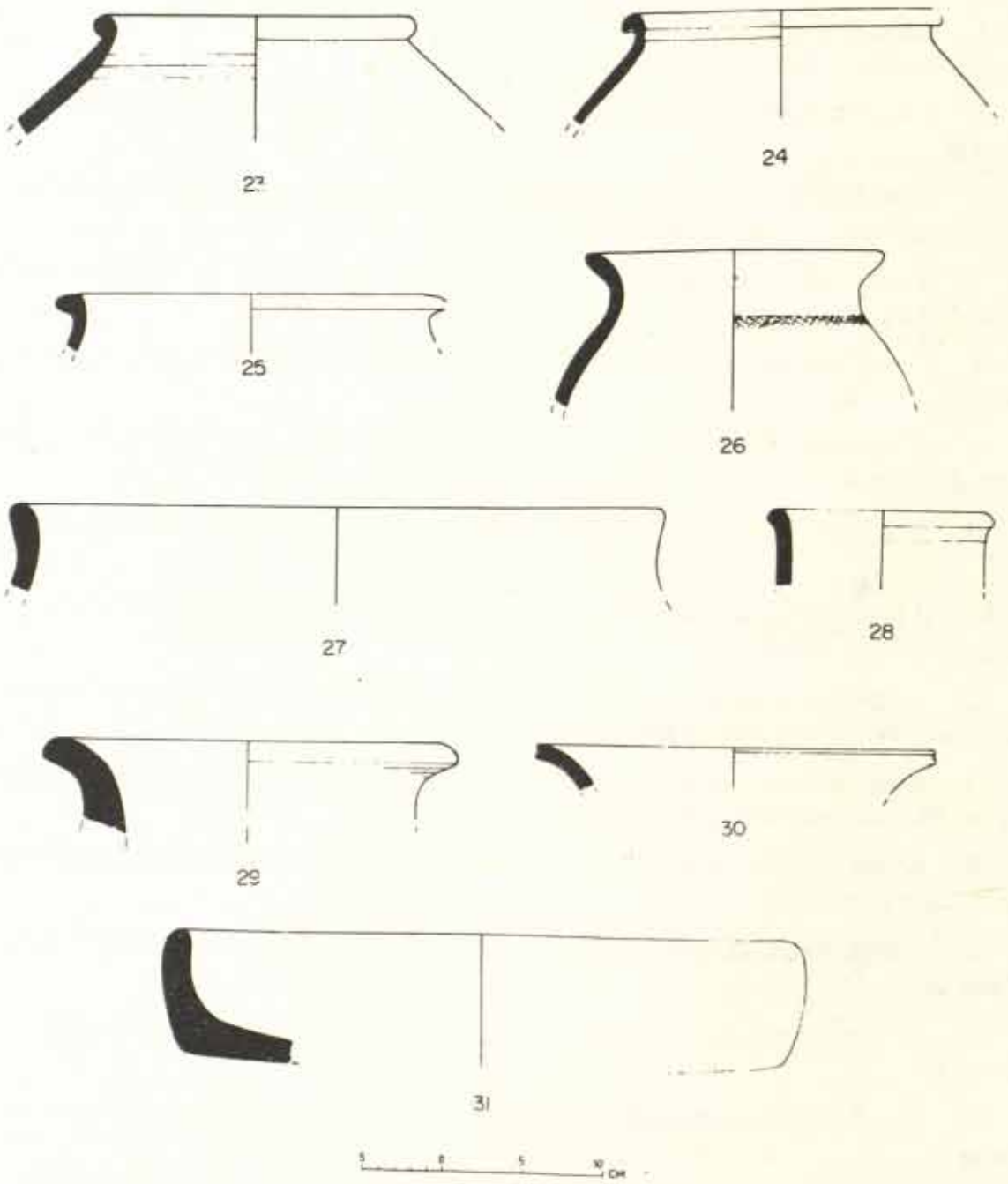


FIG. 8 : *Associated Red Ware*

20. A beaded rim of a bulbous jar with concavo-convex neck, having grooves on the outside. Top of the rim having diagonal grooves as decoration. Highly weathered, peeling red wash. Phase B.

21. A thin concavo-convex "*handi*" with incurved beaded rim having space for lid, red wash, ill-fired. Phase B.

22. A typical high necked jar, with everted beaked rim, slipped on both sides. Phase B.

Fig. 8

23. A storage jar with externally beaded rim, oblique shoulder, internally marked with corrugations. Ill-fired, slipped. Phase A.

24. A globular vase with an externally beaked rim, short concave neck, internally marked with a bold groove and bulging profile. Ill-fired, externally treated with slip. Phase A.

25. A vase with a flanged rim, short concave neck. Well fired, slipped. Phase B.

26. A globular vase with an out-turned thickened rim, almost short vertical neck, bulging profile externally decorated with incised criss-cross pattern. Ill-fired, treated with slip and burnished externally. Phase A.

27. A straight sided storage jar with a featureless thickened rim. Well-fired, slipped. Phase B.

28. A high necked jar with beaded rim, and straight neck. Ill-fired, slipped and weathered. Phase A.

29. A thick high necked jar with flared thickened rim with concave neck. Ill-fired, slipped. Phase A.

30. A vase with splayed externally grooved rim, ill-fired, well slipped. Phase B.

31. A trough (dough) with a featureless thickened rim and flat base (Surface).

Fig. 9

1. A bowl with sharp straight rim and slightly convex body, well fired, unslipped. Phase B.

2. Basin with sharp incurved rim, convex body and ring base, ill fired, slipped and burnished, broken at the base juncture. Phase B.

3. A bowl with slightly incurved thickened rim and convex body. Ill-fired, well slipped, burnished. Phase B.

4. A thick basin with a snubbed slightly everted rim, medium fabric, well fired, unslipped. Phase B.

5. A bowl with a slightly incurved rim having groove on the dorsal side, treated with thick slip on both sides. Phase B.

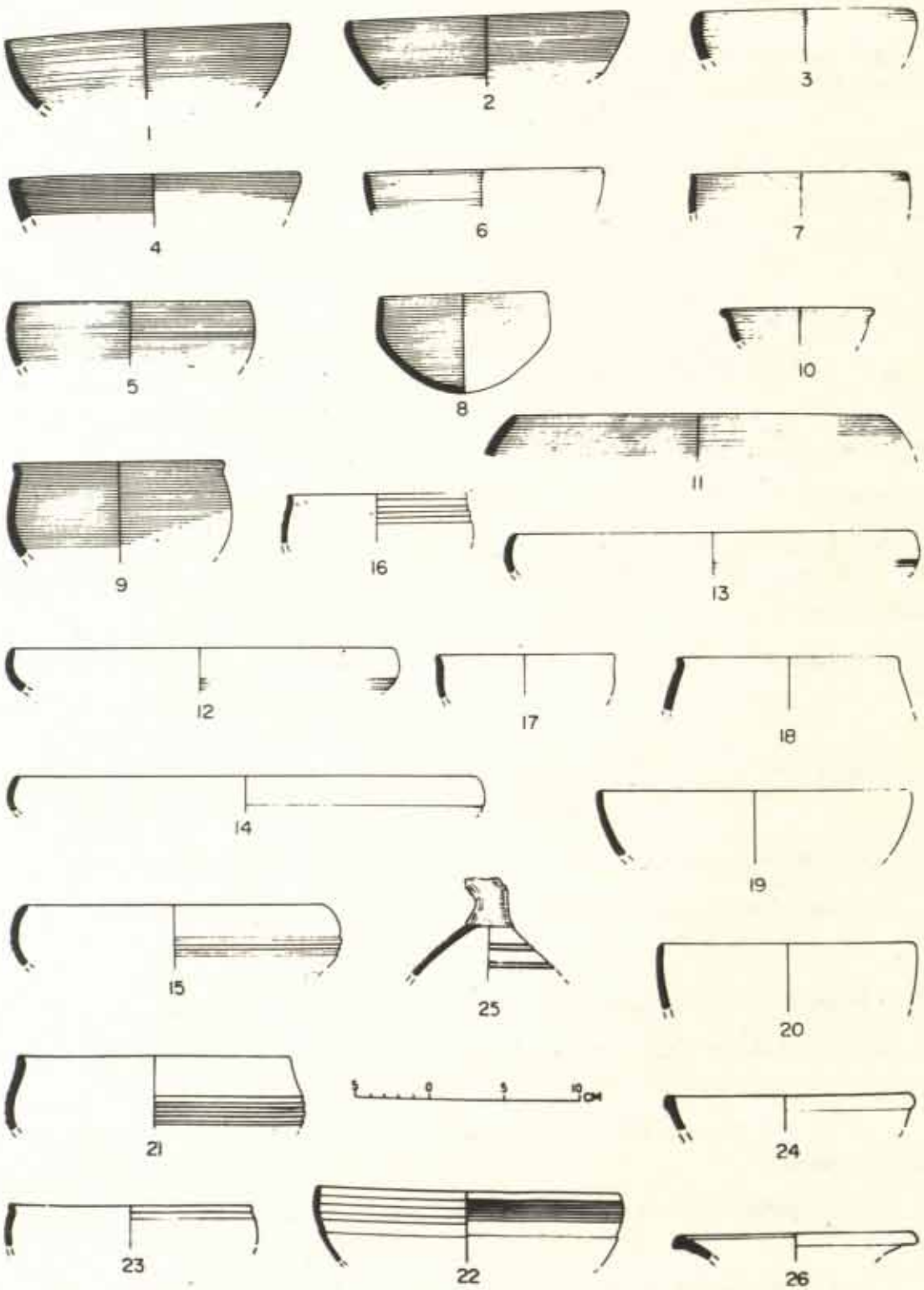


FIG. 9 : 1-11, *Black-and-Red ware and* 12-26, *greyish black ware*

6. A bowl with a knife-edged rim and convex sided body, well fired, rim blackened, rest of the body fine slipped, well burnished. Phase A.

7. A bowl with a knife edged slightly everted rim. Well fired, slipped. Phase B.

8. A typical bowl with knife edged rim having concavo-convex carinated body. Ill-fired, external surface having red slip, burnished. Phase B.

9. A deep bowl with thin everted, slightly beaded rim and thick convex body, ill-fired, unslipped. Phase B.

10. A basin with out-turned beaded rim, constricted neck and convex body, ill fired and unslipped. Phase B.

11. A bulbous big bowl with sharp slightly incurved rim, ill fired, externally slipped, burnished. Phase B.

12. A wide mouthed basin slightly incurved, straight rim and at the turning point above the base, three grooves on dorsal side. Ill-fired, well-slipped. Phase B.

13. A wide mouthed basin with slightly incurved featureless rim, having three grooves on the dorsal side. Ill-fired, slipped. Phase B.

14. A dish with featureless in-curved rim and in-curved sides. Well fired, slipped. Phase A.

15. A wide basin with incurved sharpened rim having three grooves on the dorsal side. Ill-fired, slipped. Phase B.

16. A bowl with incurved featureless rim with two grooves on dorsal side, convex body, well fired, slipped. Phase B.

17. A small bowl with slightly everted rim and rounded body. Well fired and slipped. Phase A.

18. A wide mouthed bulbous bowl with almost straight sides having beaded everted rim. Ill fired, well slipped. Phase B.

19. A deep bowl with sharpened rim and tapering sides. Ill fired, slipped, burnished on both sides. Phase B.

20. A bowl with sharpened featureless rim and straight sides. Well fired, well slipped, burnished. Phase B.

21. A deep bowl with a wide mouth slightly everted snubbed rim, with convex corrugated shoulder, ill fired, well slipped. Phase B.

22. A bowl with fatureless rim, thin neck internally having four grooves and externally multigrooved with ledged shoulder and convex body, well fired, slipped, burnished. Phase B.

23. A bowl with everted externally beaded and obliquely cut rim, bulbous body of medium thickness, well fired, externally grooved, fully slipped and internally slipped only on rim. Phase A.

24. A basin with clubbed rim with convex shallow body, ill fired, well slipped. Phase A.

25. A lid with a luted bird shaped knob having two grooves on the convex body. Ill-fired, slipped and burnished. Phase B.

26. A shallow basin with out turned beaded and ledged rim, well fired, well slipped. Phase B.

Pl. X

1. A black ware sherd of a bowl with graffiti marks on the outside indicating an inverted triangle with perpendicular from its apex. Common on chalcolithic pottery of Central India. Both sides slipped and burnished. Phase B.

2. A small red ware sherd with brownish slip on the outside and unslipped inside. There is a thin graffiti indicating a multiplication mark. Phase B.

3. A Black-and-Red ware sherd with burnished surface. A pair of "V" markd in graffiti. Phase B.

4. A Black-and-Red ware sherd with burnished surface. Externally it has a graffiti indicating multiplication mark. Phase A.

5. A small Black-and-Red ware sherd with unburnished slip. Inside a graffiti mark indicating parallel lines. Phase B.

6. A small red ware sherd with chocolate slip on the outside with a graffiti mark indicating multiplication sign. Highly weathered. Phase A.

CHAPTER IV

MICROLITHS

The chalcolithic blade industry in the Deccan was brought to light at Jorwe and later it was recorded at other sites in the Deccan.[1] It is associated with ceramic industry of painted pottery and coppr (chalcolithic). The technique of the blade industry and its distribution has already been discussed by Sankalia[2] and Subbarao.[3]

During the excavation at Tuljapur Garhi, in a limited area, 2,198 artefacts have been collected comprising both finished and simple artefacts. Maximum number of artefacts have come from layer (2) and (3) which is associated with Malwa and Jorwe pottery. The blade element predominates over other artefact types i.e. 11·42% along with its bi-product bladelets 3·06% and flakes 7·9%. Points constitute next major group, i.e. 1·27%, cores 1·09%, scrapers 0·31%, and lunates 0·27%, The waste and raw material is 74·64%. Thus, it can be seen from the statistical analysis that the finished product is only 25·32% which clearly indicates that the blade industry was indigenous (as shown in the chart).

The tools are mostly fashioned on silicious raw material like chalcedony, agate, and jasper, which is locally available in the form of nodules in the river bed and also in the vesicles of trap in the form of nodules.

The technique of manufacture of tools are the same as found in other chalcolithic sites like Jorwe, Nevasa, Daimabad, and Prakash.

In general, the cores are comparatively very less. In a few worked cores, crested guided ridge technique is seen. Crested ridge flake-blades are very few. The exhausted cores have been rejuvenated as chisels and core scrapers.

It is interesting to note that two neoliths (fig. 11, 16–17) from the surface were found in the rain-gullies, but during excavation no such tools were found in stratigrapplical context, may be due to limited dig.

The chart shows distribution and frequency of blade industry in the excavation.

---

[1]Sankalia, *et. al., op. cit.*, pp. 114-115.

[2]H.D. Sankalia, B. Subbarao and S.B. Deo, *"Excavations at Maheshwar and Navadatoli"* (1952-53), (1958), pp. 41-65.

[3]B. Subbarao, "Chalcolithic Blade industry of Maheshwar (Central India) and a note on the history of Technique", *BDCRI*, Vol, XVII, No. 1 (1955), pp. 126-149.

FREQUENCY DISTRIBUTION OF MICROLITHS

		Blades					*Blade-lets*	*Points*			*Lun-ates*	*Scra-pers*	*Flakes*		*Cores*	*Waste & raw mate-rial*	*Grand Total*
	Layers	Single Parallel sided Blades	Parallel sided Blades (single ridge)	Parallel sided Balades (double ridge)	Backed Blades	Penknife Blades	Bladelets	Points	Simple Flake Points	Asymetrical Crescentic Points	Lunates	Scrapers	Simple Flakes	Rejunated Flakes	Cores	Waste & Raw Materials	Grand Total
PHASE B	1	11	24	6	9	2	27	4	0	3	1	0	37	0	5	367	496
	2	22	71	23	12	8	20	6	1	4	5	7	77	6	12	790	1064
Total		33	95	29	21	10	47	10	1	7	6	7	114	6	17	1157	1560
Percentage		2.11	6.08	1.85	1.34	0.64	3.01	0.64	0.06	0.44	0.38	0.44	7.30	0.38	1.08	74.16	99.91
PHASE A	3	15	28	6	10	1	19	7	0	2	0	0	40	0	5	413	546
	4	0	1	1	0	0	1	1	0	0	0	0	12	0	2	58	076
	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	007
Total		15	29	7	10	1	20	8	0	2	0	0	33	0	7	477	629
Percentage		2.38	4.61	1.11	1.58	0.15	3.17	1.27	0	0.31	0	0	8.42	0	1.11	5.83	99.94
Total of Phase A & B		250					67	28			6	7	173		24	1634	2189
Total Percentage		11.42					3.06	1.27			0.27	0.31	7.90		1.09	74.64	99.96

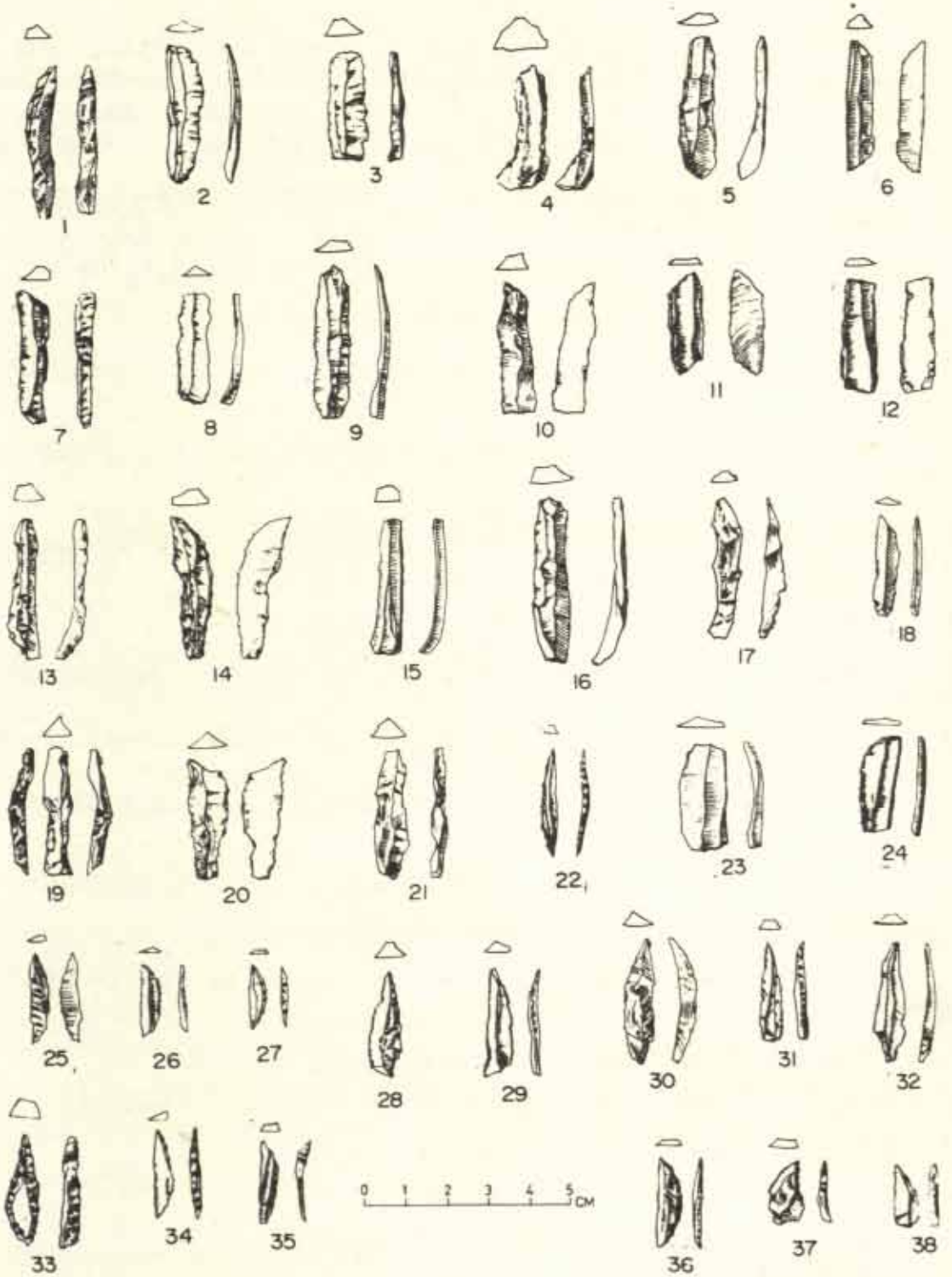


FIG. 10 : *microliths*

A. Blades

In this group are fine samples of parallel sided, blunted-back, unretouched as well as crested ridge blades and flake-blades are common. The occurrence of which are characteristic feature of the Chalcolithic blade industry. However, mention may be made of absence of typical ribbon flake blades. The range of tools fall within 45 mm - 20 mm in length and 41 mm - 11 mm in width.

1. Chalcedony, parallel sided blade, snappd at both ends, retouchd on both sides, one of the side is inversely retouched (fig. 10, 12).

2. Chalcedony, parallel sided flake-blade, one side is slightly serrated (fig. 10, 2).

3. Chalcedony, parallel sided blade, used mark seen (fig. 10, 3).

4. Chalcedony, a short but broad parallel sided plunged flake-blade, retouched along the arc (fig. 10, 4)

5. Jasper, a long narrow flake-blade with a thick plunge, inversely retouched on one side. (fig. 10, 15).

6. Chalcedony, a thin long blade obliquely blunted on both ends (fig. 10, 6).

7. Chalcedony, short but broad blade without retouch (fig. 10, 23).

8. Chalcedony, flake-blade of crested-ridge technique (fig. 10, 17).

9. Chalcedony, a thin, long parallel sided blade, with sharpened tip, used marks seen (fig. 10, 9).

10. Chalcedony, flake-blade without retouch (fig. 10, 10).

11. Chalcedony, a thick flake-blade, unfinished, both ends snapped, used marks seen (fig. 10, 11)

12. Chalcedony, a plunged flake, retouched on one side, cortex retained (fig. 10, 13).

13. Chalcedony, a thiner long plunged flake blade with retouch (fig. 10, 5).

14. Chalcedony, a thin long parallel sided blade with two medial ridges, used marks seen (fig.10, 16).

15. Chalcedony, parallel sided blade with used marks seen (fig. 10, 8).

16. Chalcedony, a long crested ridge flake-blade (fig. 10, 19).

17. Chalcedony, a regular crested ridge flake-blade (fig. 10, 21).

B. Penknife Blades

1. Chalcedony, a long blade with sharp curved tip, blunted along one edge, notching in the centre for hafting, retouched (fig. 10, 14).

2. Chalcedony, thin and short, tip curved and sharp, bimarginally retouched (fig. 10, 18).
3. Chalcedony, small, oblique tip, blunted backed with mid-ridge (fig. 10, 24).
4. Chalcedony, thick blunted backed with incipient tang (fig. 10, 7).
5. Chalcedony, unworked blade (fig. 10, 2).

C. Points

Among the microlithic tools, points form the second major group. These points are prepared from flakes and blades. The points on blade constitute a sub-group by itself. Except a few, rest are worked unifacially. A few show tang, mid-ridge and trimmings.

1. Chalcedony, a simple thick flake point (fig. 11, 5).
2. Chalcedony, a typical simple flake point with a tang, retouched at the distal en (fig. 10, 32).
3. Chalcedony, simple point on a crested ridge flake (fig. 10, 30).
4. Chalcedony, a point on sub-triangular flake, obliquely flaked on both sides to form a point. (fig. 11, 15).
5. Chalcedony, a point on a thick asymmetrical flake, the sides indented by flake scars, tip blunted (fig. 11, 1).
6. Chalcedony, thin flake-blade with medial ridge on the front, steeply trimmed along the both arc to give a sharp point. Base thinned by retouching, probably for hafting (fig. 10, 31).
7. Chalcedony, point on a crescentic flake-blade, fully retouched along the arc and the other side unworked, distal end obliquely snapped (fig. 10, 29).
8. Chalcedony, a typical thin, narrow, crescentic blade, arc minutely worked to form a point. Distal end shows constriction for hafting (fig. 10, 22).
9. Chalcedony, a thick sub-triangular flake, retouched on one edge to form a point, cortex seen (fig. 10, 28).
10. Chalcedony, small thin flake-blade, front face worked to form a beaked point, base notched for hafting (fig. 10, 37).
11. Brown jasper, a tiny flake-blade made into a point by working on one side with a tangential flaking near the tip, base flat (fig. 10, 38).
12. Chalcedony, a tiny narrow crescentic flake-point, worked along the arc with oblique retouch near the tip and worked at the base for a tang (fig. 10, 35).
13. Chalcedony, an awl point made on a thick flake. Single shoulder, well pronounced working point, base narrowed for hafting, cortex retained (fig. 10, 20).
14. Chalcedony, on a flake, beaked tip, tanged base (fig. 10, 1).

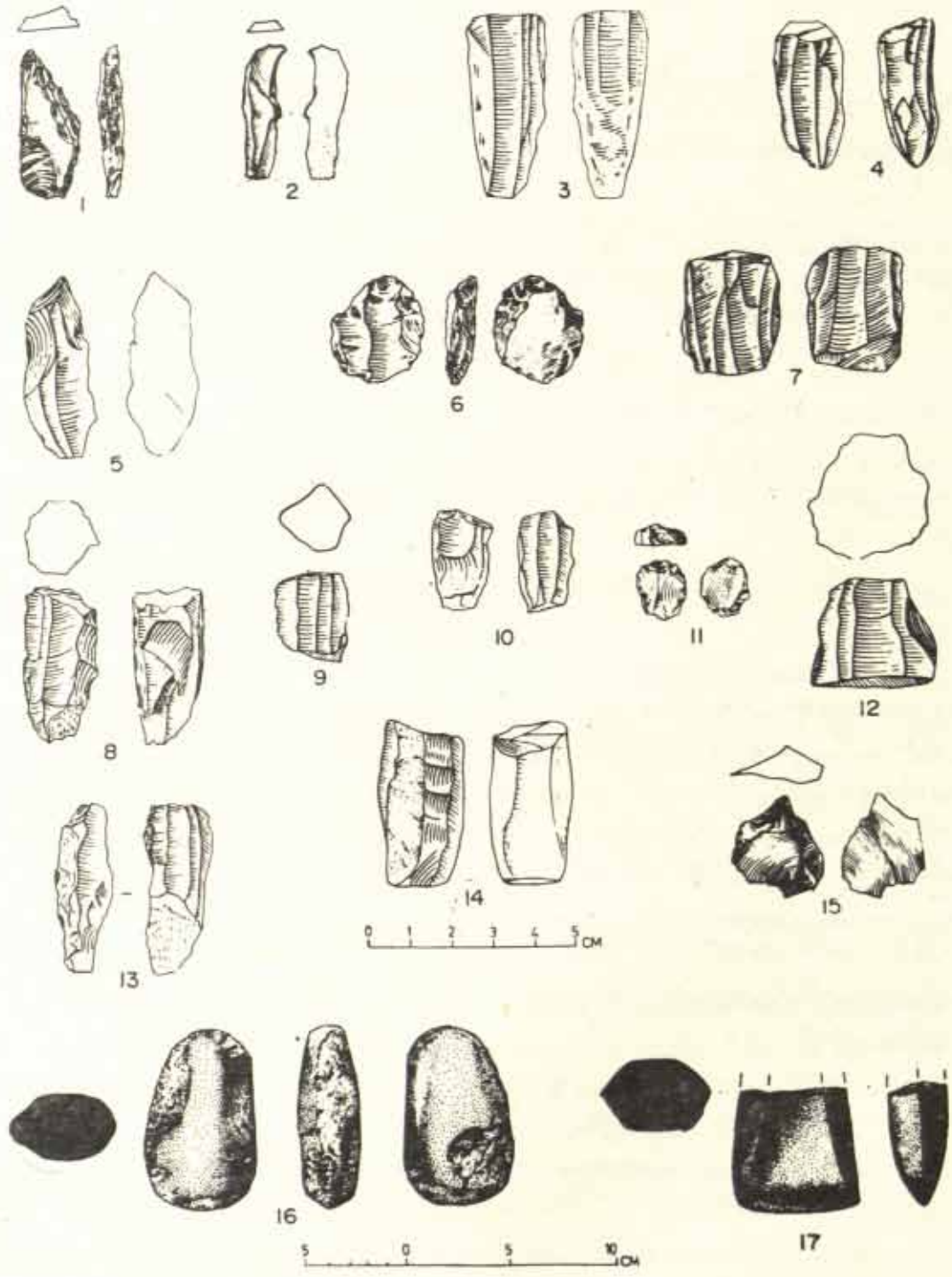


FIG. 11 : 1–15, *microlithic and 16–17, neolithic tools*

D. Lunates

1. Chalcedony, on blade, arc fully retouched along one direction, the length is more than the width, show indentation on the sharp edge (fig. 10, 26).

2. Chalcedony, on blade, thickly blunted along the arc (fig. 10, 34).

3. Variant of 2 (fig. 10, 25).

4. Chalcedony, on a blade, symmetrical, upper surface has a mid-rib, underside plain, finely retouched along the arc (fig. 10, 36).

5. Chalcedony, on blade, one of the curved edges is flaring at the end, blunted along the arc (fig. 10, 27).

E. Borer

1. Chalcedony, prepared on a sub-triangular nodule, finely worked all along the margin and towards the tapering point, base thick and flat. Can also serve as drill (fig. 10, 33).

F. Scrapers

1. Chalcedony, a fine example of thumb-nail scraper. The semi-circular edge is steeply but finely worked by single direction flaking (fig. 11, 11).

2. Brownish Chalcedony, a discoidal scraper on flake. Alternately worked. The platform shows meticulous working for scraping edge (fig. 11, 6).

G. Cores and Core Scrapers

1. Brown jasper, cylindrical, truncated core, one end producing chisel edge, flaked all around showing parallel blade-scars, base flat (fig. 11, 4).

2. Milky quartz, long conical shape, flat base, worked all along shows blade-scars (fig. 11, 3).

3. Chalcedony, nodule, half worked core with flat base and irregular tip showing cortex. There is an attempt to take-out flakes by crested ridge technique (fig. 11, 13).

4. Chalcedony, nodule, attempts of taking out blade by crested ridge technique seen. On the other side thin blades have been removed, base flat. End scraper on core (fig. 11, 8).

5. Milky quartz, short flat based conical core, attempts of secondary working seen on the flat base. Short thick blades have been removed (fig. 11, 12).

6. Chalcedony, short tubular flat core, rejuvenated at the distal end used as end scraper (fig. 1, 7).

7. Chalcedony, small core, tubular multi platform, short blade-let scars seen. (fig. 11, 9).

8. Variant of 7 except cortex, unworked (fig. 11, 10).

9. Banded agate, long cylindrical core, few blade scars removed, multiplatform, cortex retained (fig. 11, 14).

CHAPTER V

BEADS

Beads form a large group of personal ornamental objects, as found in such other chalcolithic sites. Total number of beads including from the surface are 152 in which 33 beads are from the surface and the rest are from the stratified deposits. More than 78% of beads are recorded from Phase B and 22% from Phase A. (as shown in the chart).

The raw material used for preparation of beads are steatite, shell, jasper, agate, and basalt. Though the beads made in copper are found, these are described under metal objects. The raw material for the beads are locally available in the form of nodules from the river bed. A few translucent varieties of amorphous and crystalline silica, *viz.*, chalcedony, agate, etc. serve as raw material which shows again the occurrence of cultural index of chalcolithic sites. Shell is also used in making beads in good quantity.

MATERIAL-WISE AND PHASE-WISE DISTRIBUTION OF BEADS

Material	*Surface*	*Phase*	*Phase*	*Percentage*	
		A	B	Phase A	Phase B
Steatite	0	10	19	8.40	15.96
Shell	7	8	20	6.72	16.80
Jasper	2	2	19	1.68	15.96
Agate	0	2	7	1.68	5.88
Carnelian	4	0	6	0	5.04
Basalt	1	1	0	0.84	0
Terracotta	0	3	16	2.52	13.44
Glass	18	0	6	0	5.04
Gold	1	0	0	0	0
Total	33	26	93	21.84	78.12

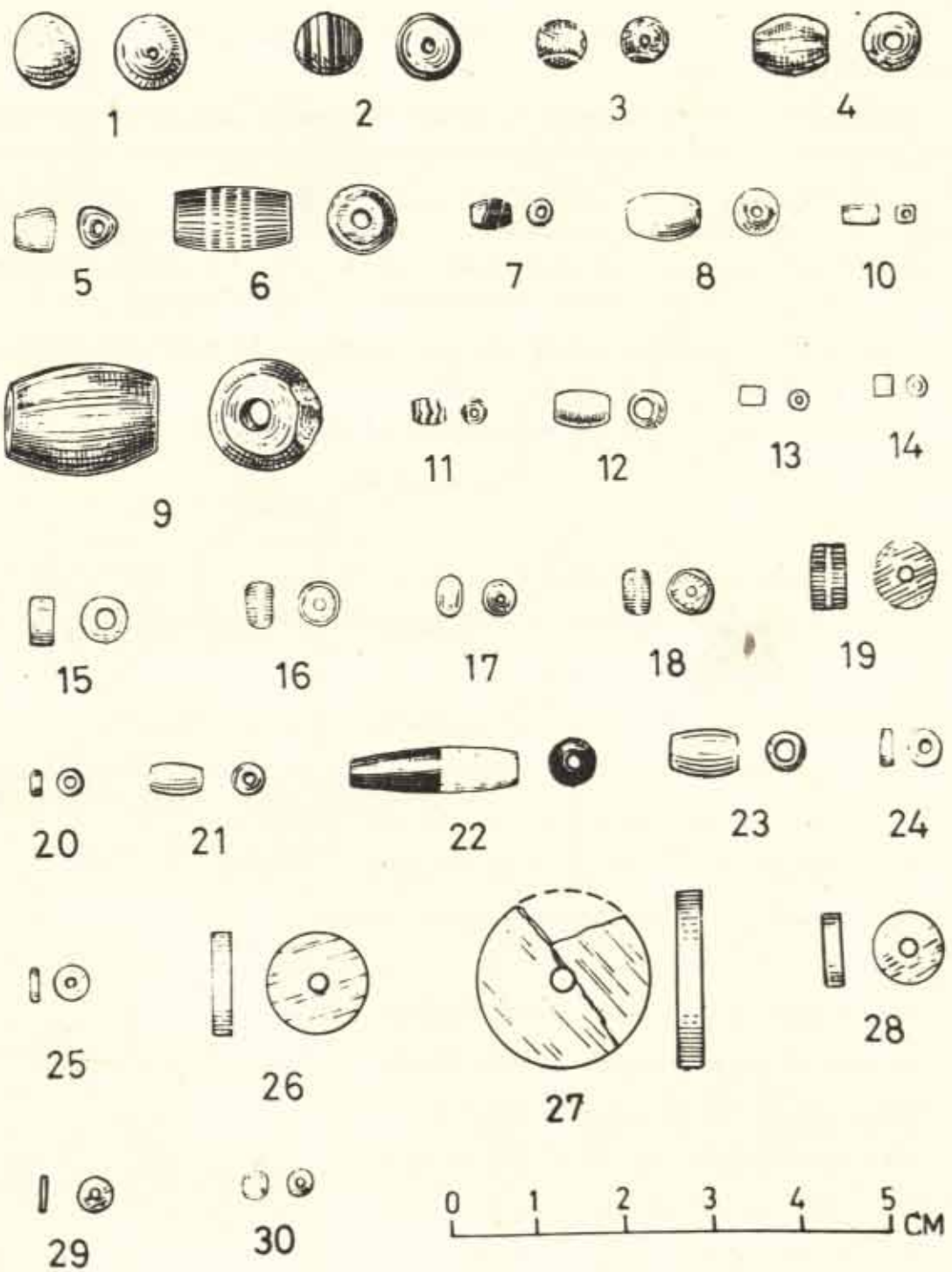

1
2
3
4
5
6
7
8
10
9
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
0 1 2 3 4 5 CM

Fig. 12 : *beads*

Total number of beads from stratified layers are 119 and 33 from Surface. Surface beads are not included for percentage.

The type represented in the semi-precious stones are mainly short cylindrical, short barrel and mostly truncated, but in the case of shell and steatite disc beads are common with perforation.

Terracotta beads found in the excavation numbers 17. A few glass-beads are found on the surface and slightly below surface humus (1). Surface finds also include a gold bead. Mention may be made of etched beads found here made up of carnelian and banded-agate, are comparable to the chalcolithic sites of Tapi and Godavari basins mentioned in the introduction.

The decorative pattern on etched carnelian beads are usually associated with megaliths, and comparable to the similar ones found in Phase B.

A. Beads of semiprecions stones and shell

(fig. 12; pl. XI)

1. Chalcedony, spherical. Phase B.
2. Banded agate, short barrel. Phase A.
3. Carnelian, globular with etched concentric lines showing in white, truncated, spherical. Phase B.
4. Carnelian, short truncated bi-cone. Phase B.
5. Blue glass, translucent, short cylindrical, triangular in section. Phase B.
6. Brownish red carnelian, long barrel, truncated with etched four parallel lines in white. Phase B.
7. Banded agate, miniature, short cylinder, circular. Phase B.
8. Agate, orange, short-cylinder, truncated. Phase B.
9. Glass, opaque, long barrel, (broken) circular. Phase B.
10. Shell, short, cylinder, square. Phase A.
11. Banded agate, short-cylinder, circular. Phase B.
12. Carnelian, cylinder, truncated, short circular. Phase B.
13. Red jasper, short tubular, circular. Phase A.
14. Shell, short tubular, truncated, circular. Phase A.
15. Shell, short cylinder, circular. Phase B.
16. Banded agate, bicone, truncated. Phase A.
17. Carnelian, short barrel, truncated, circular. Phase A.
18. Banded brown chert, short-cylinder, truncated, circular. Phase B.

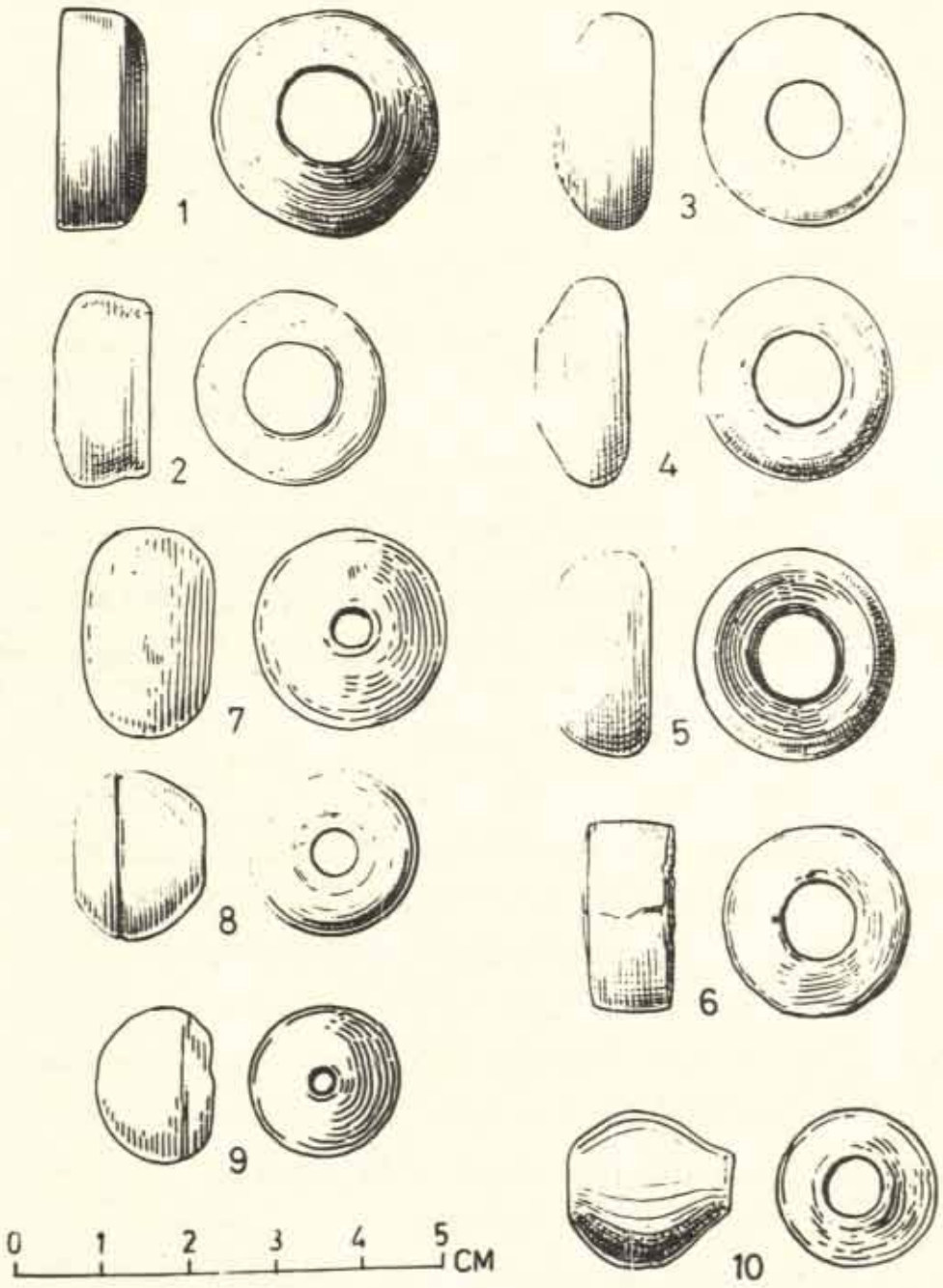


FIG. 13 : *terracotta beads*

19. Veined basalt, tabloid, circular. Phase B.
20. Steatite, micro-disc. Phase A.
21. Agate, short-barrel, circular. Phase A.
22. Banded black agate, long barrel, truncated. Phase A.
23. Shell, short cylinder, circular. Phase A.
24. Red jasper, disc. Phase B.
25. Steatite, small disc. Phase A.
26. Shell, big, disc. Phase A.
27. Steatite, large disc, broken. Phase B.
28. Shell, disc, circular. Phase B.
29. Shell, small disc. Phase B.
30. Red jasper, short barrel, circular, found in a set of eleven as burial furniture with one spacer-bead (necklace). Phase B. (Tr. A3, Qd.3).

B. Terracotta Beads

(fig. 13 ; pl. XII)

1. Terracotta, whorl, truncated. Phase B.
2. Terracotta, whorl, irregular circular. Phase B.
3. Terracotta, whorl, circular, cancavo-convex. Phase B.
4. Terracotta, whorl, squatish specimen, bi-cone, truncated. Phase B.
5. Terracotta, whorl, bi-cone, circular. Phase B.
6. Terracotta, whorl, bi-cone, circular. Phase B.
7. Terracotta, semi-spherical. Phase A.
8. Terracotta, arecanut, truncated, grooved around the body. Phase B.
9. Terracotta, arecanut, truncated, mild grooved. Phase B.
10. Terracotta, pear-shaped, treated with slip. Phase B.

CHAPTER VI

METAL AND OTHER MISCELLANEOUS OBJECTS

As in other chalcolithic sites found in the Deccan, here also in the excavation, copper objects (27 nos.) and iron objects (18 nos.) have been found. But from the stratigraphy it can be seen from Phase B which gives ample evidence of Jorwe pottery, copper objects like fish-hooks, nails, coiled rings, bangles, micro-beads have been found. It is interesting to note that from the surface and a little deeper in layer (1) and from the pit there is evidence of megalithic pottery represented by Black and Red Ware, thick greyish black were, iron objects like spear-head, nails, flattish blades have been recorded inspite of the fact, as explained in the introduction, there is high erosion in this part of habitation. But compared to megalithic sites in Vidarbha like Takalghat and Khapa[1], and Kaundinyapura[2], etc. as mentioned by its author's, here also there is inter-mixture of chalcolithic and megalithic cultural artefacts.

A. Iron Objects

(fig. 14, 1-6)

1. Spear-head with socketed end and tapering tip. Highly incrustated. Phase B.
2. A long nail, flattened top and bottom, tip broken. Phase B.
3. A blade of a knife, irregular section, highly incrustated. Phase B.
4. A bent nail, round section, highly incrustated. Phase B.
5. Blade of a long knife, rectangular section, highly incrustated. Phase B.
6. Arrow-head with socketed end, rounded section, sharp tip, highly incrustated. Phase B.

B. Copper Objects

(fig. 14, 7-15)

7. A single coiled ring with semi-circular section. Phase B.
8. A fish-hook with round section, tip broken. Phase B.
9. A stylus with round section, pointed tip. Phase B.

---

[1] S.B. Deo, *Excavation at Takalghat and Khapa* (1970).
[2] M.G. Dikshit, *Excavation at Kaundinyapura*, 1968.

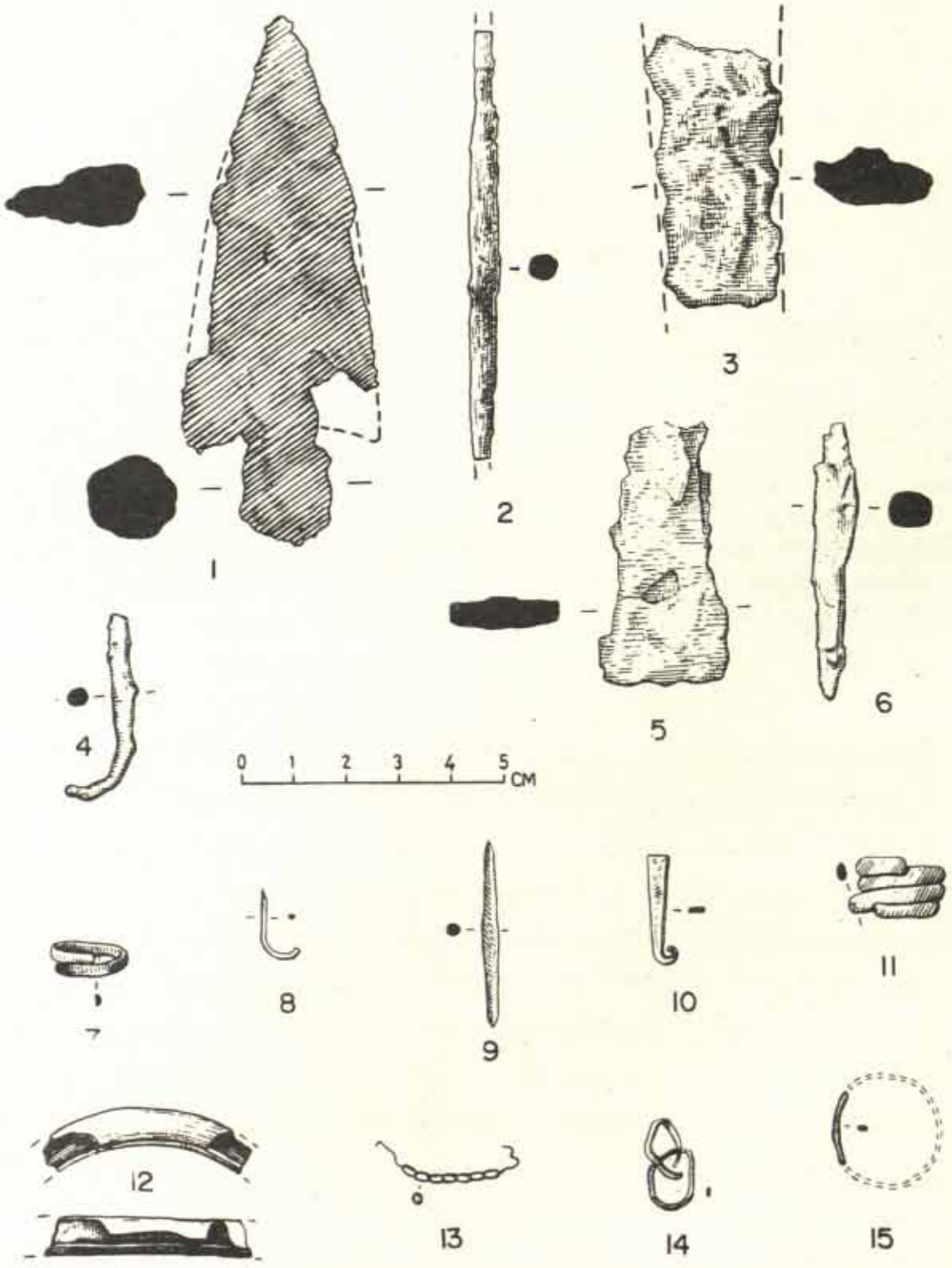


FIG. 14 : 1-6, *iron and* 7-15, *copper objects*

10. A thick flattish fish-hook, sharp. Phase B.
11. A four coiled ring with flattish section. Phase B.
12. A broken bangle with triangular section. Phase B.
13. Seven micro-cylindrical circular copper beads. Phase B.
14. Two hooks of a chain, broken, rectangular in section. Phase b.
15. A broken thin ring, conjectured. Phase B.

C. Miscellaneous Objects

1. Dolerite, ovoid in shape, may be a hammer-stone, used marks visible, section irregular, elliptical (fig. 11, 16).
2. Dolerite, a broken chisel edged axe, polished. The interesting feature of this axe is uniformally bevelled sides, section rhombus. This variety is not very common in the south (fig. 11, 17).
3. A terracotta dabber with a convex base and luted conical knob. Phase B (pl. XIII A. 1).
4. A terracotta dabber with a convex base and luted flattened knob having mild groove. Phase B: (pl. XIII A. 2).
5. A terracotta elliptical object with a flat base and little concavity on one side measures 0·11m in height and with maximum and minimum axis 0·09 m and 0·07 m respectively. Cult object? (pl. XIII B. 1).
6. A terracotta dome like object with a flat base having a height of 0·17 m and the diameter of the base 0·14 m. This may probably be a cult object ? (pl. XIII B. 2).

CHAPTER VII

CONCLUSION

The horizontal excavation excavation undertaken revealed a cultural deposit of about 1·30 m thick, belonging to a single culture, i.e. Chalcolithic period, divided into two sub-phases A and B. Malwa ware and Jorwe ware are the main pottery assemblage of Phase A and B, respectively with overlapping. The division is made, though slender, to focus the identifiable pottery of Malwa and Jorwe.

Phase A is characterised by the occurrence of Malwa ware. These are painted in pre-firing stage either in black or in violet. The painted designs largely include horizontal bands, vertical lines and groups of diagonal lines. The main types are bowls, dishes and vases. Besides pottery, other important antiquities are steatite micro-beads, terracotta beads, bone points and beads of semi-precious stones such as jasper, agate and carnelian. Perhaps due to restricted dig the spade has missed the copper. A good number of microliths as usually found with chalcolithic sites of Tapi valley a characteristic feature of chalcolithic site of the Deccan, is also recorded here. The main types are parallel sided flake blades, crescentic points, few scrapers and cores.

Phase B is represented by Jorwe ware of fine fabric. The painted designs are of criss-cross pattern, groups of diagonal lines, wavy lines, ladder designs and horizontal bands on the most characteristic carinated bowls, high-necked jars and limited spouted vessels. A solitary piece of long spout is higher than its neck, similar to the type found at Nevasa. Occurrence of copper ring, bangles, fish-hooks and micro-beads besides other important antiquities such as stylus, etched carnelian beads are interesting to note. Such etched stone-beads make typical burial furniture of Megaliths of Vidarbha.

The rest of the wares such as red ware (both slipped and unslipped), greyish black ware and Black-and-Red ware are common in both the phases. The fabric of red ware ranges from coarse to medium. The types in this ware are vases, basins, and jars. Greyish black ware and Black-and-Red ware are of medium fabric. Dishes and bowls are common here. Graffiti is also noticed on a few sherds of red ware and Black-and-Red ware. Unlike pottery, terracotta, shell, agate, carnelian beads and animal bones are common in both the phases except the carnelian etched beads which are found in Phase 'B'.

The interesting discovery at the site was of a child burial in a small oval shallow pit in Phase B. The burial is of a secondary nature with long bones and the skull lying in east-west orientation. A small bowl of Black-and-Red ware was kept near the skeleton as burial furniture. Twelve carnelian

beads were found scattered along the neck portion of the child.

A potter's kiln irregular in shape with its inlet and outlet, is associated with charcoal, potsherds and a terracotta dabber and cult object found within the house plan of this phase.

The two terracotta objects are from the surface and another from the stratified layer near the kiln, appears to be cult objects of those chalcolithic people. Mention may be made that such terracotta objects have not so far been reported in any other chalcolithic sites dealt in the report (pl. XIII B).

Inhabitants representing in both the phases A and B lived in oval or circular huts built of perishable material. There is evidence of bamboo impression on the burnt floor.

The floors of the houses were made of rammed clay mixed with kankary sand, interspersed with river pebbles. Two 'chullahs' were noticed in such hut floors.

As regards the economy of the chalcolithic people at Tuljapur Garhi was concerned, it was based on agriculture and partly domestication of animals (such as cattle, goat, dog, etc.) alongside gathering and hunting of small as well as big games, which is supported by the archaeobotanical and archaeozoological evidences. The plant remains from the site show that the early farmers at the site practising agriculture and had the knowledge of harvesting two major crops in a year, i.e. winter (Karif) and summer (Rabi). Their winter crops included wheat, barley, lentil, grass-pea, and gram; whereas summer harvest was confined to rice, great millet, hyachinth bean, horse gram, pigeon pea, black gram, and green gram. From the ethnographic parallels it may be presumed that they also raised ? Kenaf (Deccan Hemp) / ? Roselle for exploitation of fibers and vegetables, the evidence of which has also been recovered from the excavation. The occurrence of seeds of babul is interesting, as this is the second occurrence of seeds of this species from the Deccan. The occurrence of grains of great millet and pigeon pea especially from the later phase (Jorwe) is an excellent evidence of the farming economy. Looking at its natural diversity and distribution of the wild relatives of pigeon-pea, it is clear tnat it must have been domesticated in Western India.

So far the demographic trend during both the phases is concerned, it may be mentioned here that there is increase trend in population or intensive human activities is observed from Phases A to Phase B. Phosphorus content and organic carbon present in soil at various levels from bottom to top show an increasing trend indicative of intensive human habitation from earlier to later phase. This is also substantiated by the archaeo-botanical and archaeozoological evidences from the site, which show increase in varieties of species and density towards the later phase.

In general piecing together all the evidences it may be concluded here that Phase B jorwe culture was more prosperous both in economy and population over the earlier Malwa phase A.

So far the chronological aspect of the Chalcolithic habitation at the site is concerned it will be quite premature to say any thing at this stage in absolute terms on the basis of C 14 dates obtained from the site. However, three out of four dates obtained show some consistencey, on the basis of which it may be presumed that Malwa culture at the site had its beginning slightly earlier than first millenium B.C. and continued till 5th century B.C. during Jorwe Phase. On the basis of cultural

material obtained and its comparative study with the Malwa and Jorwe cultural materials of the western Deccan, it may be assumed that the chalcolithic habitation at Tuljapur Garhi had its beginning slightly later than its place of origin in western Deccan.

HIGHLIGHTS OF THE EXCAVATION

Though the excavation was very limited, it is indeed highly promising in view of the fact that whatever was anticipated from the surface collection has come true in the scientific stratigraphical limited digging viz., (a) surface humus at certain places gave evidence of occupation by the Megalithic folk of Vidarbha type; (b) below that in the black cotton soil there was unmistakable occupation of Malwa-Jorwe habitation proved by the occurrence of characteristic pottery and antiquities. House plans show identical picture as seen in other typical Jorwe sites (Daimabad); (c) The excavation found it necessary to make a marginal division in the entire cultural deposit, as at the lower level stratigraphically the Malwa pottery occurred more along with chalcolithic blade industry. This is labelled as Phase A.

Phase B naturally had given stratigraphically more of Jorwe pottery and its allied antiquities including a child burial which may be a freak one as excavation was limited.

In view of the above facts and comparative study of chalcolithic sites of the Tapi and the Godavari doab, it can be affirmed that the excavation at Tuljapur Garhi confirms that the chalcolithic people of Malwa-Jorwe complex definitely made an attempt to intrude for occupation in the Purna valley which is in mid-Vidarbha. Therefore, this excavation by itself becomes vital for further research to the extension of chalcolithic culture in this region. Thus, Tuljapur Garhi, is an eastern most outpost of Malwa-Jorwe Culture. One major reason accountable for least occupation of this area, by the chalcolithic people, may be due to the high salinity of the soil and scarcity of potable water, which is evidenced by the Geological study[1].

---

[1] P.G. Adyalkar, "Palaeogeography, Nature and Pattern of Sedimentation and Ground Water Potentiality of the Purna Basin of Maharashtra". *Proceedings of the National Institute of Sciences of India.* Vol. 29 A, no. 1 (1963).

APPENDIX I

HUMAN SKELETAL EVIDENCE FROM CHALCOLITHIC TULJAPUR GARHI

S.R. Walimbe *

The Post-Harappan, Chalcolithic site of Tuljapur Garhi (21° 10' N; 77° 35' E) is situated on the right bank of the river Purna, a tributary of river Tapti, about 240 km west of Nagpur. The site was subjected to large scale horizontal excavation by the Excavation Branch of Archaeological Survey of India, Nagpur during 1984-85 field season. The excavations have revealed a single cultural Chalcolithic deposit which is, on the basis of pottery types, etc., divisible into two sub-phases, *viz.*, Phase A: Malwa and Phase B: Jorwe.

The Phase B, Jorwe, yielded an evidence of a child burial (pl. VIII) in a small oval shallow pit. The burial (recovered from Trench A3, Quadrant 3, sealed by layer 1, excavation date February 7, 1985) is of a secondary nature with the long bones and the skull lying in almost east-west orientation. A small bowl of Black-and-Red ware was kept near the skeleton perhaps as burial furniture. Twelve carnelian beads were found scattered along the neck portion of the child.

Laboratory analysis of the osseous remains collected from the burial pit was undertaken in the palaeo-anthropology laboratory of Deccan College, Post graduate Research Institute, Pune during October 1985. The results of this study are outlined below.

Preservation and Skeletal Inventory.— The burial contains cranial, post-cranial and dental elements of a child. Some of the long bones are complete permitting reasonably accurate estimation of length.

Numerous fragments of cranial vault are present but difficult to identify with certainty. Moreover, the parts that present are heavily coated with matrix and preservative which was used during the excavation. Any item to remove this coating results in fresh breaks. Left side of the neurocranium is better preserved than the right side. A frontal fragment preserving left superior orbital margin is present. The left parietal is the only complete bone which retains almost complete length of sagittal suture and posteriorly about 4 cm length of lambdoid suture. The bone is well preserved and devoid of preservative or matrix coating. The right parietal is totally missing. The left temporal preserves squamous and petrous portion, the external auditory meatus is complete

* Department of Archaeology, Deccan College, Postgraduate Research Institute, Pune.

[1]Few Radio Carbon dates are available for this site. The dates are : 3310 ± 90 Y.BP; 2410 ± 100 Y.BP; 2870 ± 100 Y.BP.

superiorly. Zygomatic process is broken, however, root of the process is distinguishable. The right temporal is represented by the petrous portion only. About ten more small-sized fragments of neurocranial elements are preserved but neither is complete, nor identifiable with certainty; perhaps they represent the occipital and the right parietal.

Severe damage has occurred to the facial skeleton. Right maxilla is the only bone present which too is partially damaged. It retains the lower margin of the nasal aperture as well as part of the lower orbital margin. Two teeth, Rdc and Rdm^1, are preserved in the jaw fragment. The alveolar margin is damaged but teeth are in their proper place. Both the teeth are fully erupted and are in occlusion. Several other maxillary teeth are present but isolated. These include Ldm^1, R/Ldm^2, Ldc and permanent germ of I^1 (?). No mandibular tooth is represented in this collection; nor mandibular corpus is preserved.

The post-cranial skeleton is no better preserved. The pectoral girdle is entirely missing and only bone representing the upper extremities is right ulna. This long bone is completely preserved. The proximal end is undamaged but the distal end is broken post-mortem. Shaft is almost complete and fairly accurate estimate of length is possible. No other bone from the upper limbs is present. The pelvic girdle is missing. The right femur is completely preserved; slight damage has occurred distally to the shaft but the ends are intact. The right tibia is represented by about 4 cm length of mid-shaft region. A small piece of mid-segment of fibula (right ?) is also present. No bone of the left leg is identifiable. There are twelve small-sized splinters of long bone, none carry any distinguishing anatomical landmark and are consequently unidentifiable. Three long bone epiphyseal caps, two vertebral centra and one rib fragment complete skeletal inventory for this burial.

Description.— As noted earlier, the cranial fragments are heavily encrusted with matrix and preservative. This precludes further morphological observations.

The deciduous teeth preserved are complete in respect of crown calcification. The R/Ldm^1 exhibit more or less complete root. On the occlusal surface they show grade 7 cusp development (Dahlberg 1949). The dm^2s are grade 4 in cusp development. None of the molar teeth exhibit Carabelli's trait. The permanent germ I^1 is yet to achieve complete crown calcification. The incisive edge is serrate.

The metric data for dentition (specimen TPG 2) is presented in table below.

Tooth	*Side*	*Crown Diameter*		*Crown Indices*		
		MD	*BL*	*CA*	*CI*	CM
Maxillary						
dc	R	6·0	5·9	35·4	101·7	6·0
	L	6·1	5·9	36·0	103·4	6·0
dm^1	R	8·2	10·2	83·6	80·4	9·2
	L	(8·2)	10·2	82·6	79·4	9·2
dm^2	R	9·0	9·6	86·4	93·8	9·3
	L	8·9	9·7	86·3	91·8	9·3

Note : Mesio-distal crown diameter (MD) and bucco-lingual crown diameter (BL) are measured following Moorees (1957). Computation of Crown area (CA), Crown index (CI) and Crown module (CM) is according to the formulae by Wolpoff (1971). MD diameter for Ldm^1 is estimated.

The dentition preserved exhibit pathological lesions of hypoplasia in the form of pitting. The lesion is evident on all the surfaces except the occlusal. Hypoplasia, defective enamel formation is most frequently attributed to vitamin-D deficiency in the diet or prolonged fever during the period of active enamel matrix formation (Scott and Symons 1972). Dental caries, in initial stages, are observed on first molar teeth.

Two bones of this specimen are complete. The right ulna measures 105·4 mm in length whereas the right femur give a value of 153·2 mm for the same measurement. The post-cranial bones, especially the ulna and the rib fragment exhibit moderate bone erosion. However, no pathology may be attributed to it. The weathering may be due to differential soil conditions and other post-mortem effects on bone.

Age determination.— The long bone length data provide a clue for the estimation of age at time of death. Ulnar length for 1·5 to 2·5 years old Arikara children (Merchant and Ubelaker 1977) give the mean value of 108·5 mm, the range being 94·0 mm to 116·0 mm. Femoral mean length for the same age bracket is 167·1 mm the range being 141·0 mm to 186·0 mm. Bone lengths of Tuljapur Garhi child fall below the mean values for Arikara sample. The Inamgaon specimen INM 176, whose age at death is estimated as 2 years to 2·5 years on the basis of dental calcification data, give values of 108·0 mm and 160·0 mm for ulna and femur respectively (Lukacs and Walimbe 1986). On the basis of this comparison an age of around two years may be suggested for this individual.

All the deciduous teeth have completed crown calcification which suggest an age of more than 11 months. The deciduous first molars are on the verge of completing root calcification, an event which generally occurs at the age of 2·25 years. The permanent germ I^1 is incompletely calcified suggesting an age of less than 4 years (Hunt and Gleiser 1959).

The best estimate for the age of this individual be between 20 to 24 months at the time of death.

Sex determination.— The specimen is too young to have manifestation of secondary characters. Consequently no comment can be made about sex determination of this individual.

Comment.— On the basis of one immature and fragmentary skeleton nothing can be said about the biological composition or racial affinity of the Tuljapur Garhi population. However, this evidence of human skeleton itself is important since it comes from the so far only known Chalcolithic site of the Vidarbha region of Maharashtra.

Acknowledgement

The author is deeply grateful to M.S. Nagaraja Rao, Director General, Archaeological Survey of India and B.P. Bopardikar, Superintending Archaeologist, Archaeological Survey of India, for giving this opportunity to examine the specimen.

References

Dahlberg, A.A. "The dentition of American Indians", *Physical Anthropology of the American Indians,* W.S. Laughlin (ed.), (New York,–1949), Viking Fund, pp. 138-176.

E.E. Hunt and J. Gleiser, "The estimation of age and sex of preadolescent children from their bones and teeth, *American Journal of Physical Anthropology,* 13, (1959), pp. 479-487.

J.R. Lukacs and S.R. Walimbe, *"The Physical Anthropology of Human Skeletal Remains from Chalcolithic Inamgaon,* Volume I, *An Osteobiographic Analysis* (Pune 1986).

V.L. Merchant and D.H. Ubelaker, "Skeletal growth of the protohistoric Arikara", *American Journal of Physical Anthropology,* 46, (1977), pp. 61-72.

C.F.A. Moorrees *The Aleut Dentition,* (Cambridge, 1957).

J.H. Scott and N.B.B. Symons, *Introduction to Dental Anatomy,* Sixth Edition, (Baltimore 1972).

M.H. Wolpoff, *Metric Trends in Hominid Dental Evolution,* Case Western Reserve University, Studies in Anthropology, 2, (1971), pp. 1-244.

APPENDIX II

PALAEOBOTANICAL INVESTIGATIONS ON CHALCOLITHIC TULJAPUR GARHI

M.D. Kajale*

This palaeobotanical report is based on the study of ancient carbonised plant remains recovered from a Chalcolithic site at Tuljapur Garhi (21° 10' N; 77° 35' E), District Amraoti, Maharashtra. This was the only chalcolithic site detected and excavated in Vidarbha region of Maharashtra until recently. The site was excavated by Shri B.P. Bopardikar, Superintending Archaeologist, Prehistory Branch of Archaeological Survey of India who kindly entrusted the materials for scientific investigations. The site has revealed about 1·5 m thick cultural deposit belonging to a single culture, i.e. Chalcolithic. It is divisible into two sub-phases i.e. Chalcolithic A & B. The entire range of pottery belongs to the wheel-turned category. Malwa and Jorwe ware are the main pottery assemblages in Phase A and B respectively with signs of overlapping (personal communication : B. P. Bopardikar). The material has been critically examined under a stereo-binocular (Leitz-Wetzlar) microscope and the initial results of the analysis are given below in Table I. From the same, it would be clear that there are seventeen plant species of which fifteen are identified where as two species (in all probability wild) still remain to be determined. Of the diagnosed fifteen species, four belong to the cultivated cereals, eight to domesticated pulses, one to oil yielding plant and one to fiber cum vegetable plant and the remaining one a fodder plant. Detailed inventory of the individual samples and their cultural provenance are given in Table I and the samplewise occurrence in Table II.

The excavator has informed following radiocarbon dates on charcoal samples with half life value of 5570 ± 30 years.

(1) 2870 ± 100 Y.BP for a sample from Tr. A1, Qd 1, Layer (3), depth 35 to 56 cm;

(2) 340 ± 9 Y.BP for sample from Qd IV, layer (2), This date cannot be accepted;

(3) 3310 ± 90 Y.BP for sample from Tr. A4. Qd II, layer (1); and

(4) 2410 ± 100 Y. BP for a sample from Tr. C1, Qd I, pit sealed by layer (1).

It is yet to be absolutely clear whether there exists a perfect concordance between the radiocarbon dated trenches and layers and the grain yielding trenches and layers. Looking at the

* Department of Archaeology, Deccan Collage, Postgraduate and Research Institute, Pune.

cultural meterials it appears that there could be a correlation between the dated horizons and the levels yielding plant economy. Hence it may not be unsafe to conservatively infer on the basis of acceptable dates and the cultural grounds that the plant materials under consideration belong to the first millennium BC rather than to the late phase of second millennium BC. The plant material is assignable to Phase B (Jorwe) except one sample from Tr. A3, Quadrant III, layer (3) which may belong to transitional levels between Malwa and Jorwe cultures.

TABLE 1

DETAILS OF BOTANICAL FINDINGS & CULTURAL PROVENANCES

Sr. No.	*Details of the sample*	*Culture*	*Common name*	*Botanical name*
1.	Tr. A6, Qd. I, pit sealed by humus	Jorwe	1. Sorghum millet (Great millet, Jowar)	*Sorghum bicolor* Mill sp.
			2. Rice	*Oryza* sp. cf *sativa* Linn.
			3. Wheat	*Triticum* sp. cf *aestivum* Linn.
			4. Black gram/ Green gram	*Vigna* sp.
			5. Kenaf (Bimley jute, Deccan hemp) or Roselle	*Hibiscus* sp. cf *cannabis* Linn. or *Hibiscus* sp. cf *sabdariffa* Linn.
2.	Tr. XC1, Qd. II sealed by humus, pit No. 1	Jorwe	1. Lentil	*Lens esculenta* Moench.
3.	Tr. ZA4, Qd. I Pit No. 4, sealed by Layer (2)	Jorwe	1. Hyacinth bean 2. rice 3. Lentil	*Dolichos lablab* Linn. *Oryza* sp. (Broken grains) *Lens esculenta* Moench.
4.	Tr. A4, Qd. III, Pit No. 5, sealed by Layer (1)	Jorwe	1. Barley 2. Lentil 3. Rice	*Hordeum vulgare* Linn. *Lens esculenta* Moench. *Oryza* sp. cf *sativa* Linn.

Sr. No.	*Details of the sample*	*Culture*	*Common name*	*Botanical name*
4.		*Dolichos lablab* Linn.	Hyacinth Bean	
5.	Tr. A6, Qd. I, pit sealed by Layer (2)	Jorwe	Black gram	Vigna mungo (L.) Hepper..
			Black gram/ Green gram	*Vigna* sp.
			Kenaf ? or Roselle ?	*Hibiscus* sp.
6.	Tr. A3, Qd. III, Layer (3)	Malwa-Jorwe Transition ?	1. Rice	*Oryza* sp. cf *sativa* Linn.
			2. Barley	*Hordeum vulgare* Linn.
			3. Horse gram	*Dolichos biflorus* Linn.
			4. Hyacinth bean	*Dolichos lablab* Linn.
			5. Lentil	*Lens esculenta* Moench.
			6. Black gram/ Green gram	*Vigna* sp.
			7. Green gram	*Vigna radiata* (Linn.) Wilozek.
			8. Babul	*Acacia nilotica* (L.) Del.
7.	Tr. A6, Qd. I, Pit No. 2, sealed by humus	Jorwe	1. Rice	*Oryza* sp. cf *sativa* Linn.
			2. Great millet	*Sorghum bicolor* Mill sp.
			3. Grass pea	*Lathyrus sativus* Linn.
			4. Black gram	*Vigna mungo* (L.) Hepper
			5. Pigeon pea	*Cajanus Cajan* Mill sp.
			6. Gram	*Cicer arietinum* Linn.
			7. Unidentified type	
8.	Tr. A4, Qd. III, Pit No. 5, sealed by humus	Jorwe	1. Great millet (Lumps)	*Sorghum bicolor* Mill sp.
9.	Tr. A4, Qd. III, Pit No. 5.	Jorwe	1. Lump of grains	*Brassica* type.

BRIEF DESCRIPTION OF GRAINS

(1) RICE : *Oryza Sativa Linn.*

The grains are longish with vertical ridges and furrows and basal lateral appearing embronal position. Artefact of carbonisation could be noted in a few grains (pl. XV, 1–3)

Table of measurements in mm (nine grains from Trench A6, Qd. I, Pit 2, S.B. Humus)

	Minimum	*Maximum*	*Mean*
Length (L)	5·20	5·80	5·6388
Breadth (B)	2·25	2·60	2·466
Thickness (T)	1·50	2·00	1·7833
L/B			2·866
L/T			3·162003
B/T			1·3828

Three grains from sample . Trench A3, Qd. III, Layer (3) have following dimensions in mm.

	Length (L)	*Breadth (B)*	*Thickness (T)*
	3·2	2·05	1·20
	4·5	3·20	1·70
	3·8	2·40	1·50
Mean	3·83	2·55	1·50
L/B	1·5019		
L/T	2·553		
B/T	1·70		

(2) BARLEY : *Hordum vulgare* Linn. var *hexastichum* (pl. XV, 4–8)

The grains are more or less flat with clear ventral groove and faint dorsal groove. A few grains with roundish outline are observed. Few grains show symmetrically placed ventral groove while in others, it is asymmetrically placed, giving lop-sided appearance to the grains. Hulled nature of the grains could be inferred from the glumes preserved in some of them.

Table of measurements in mm (Ten grains from sample: Trench A4, Qd. III, Pit . 5, s.b. (1))

	Minimum	*Maximum*	*Mean*
Length (L)	4·30	5·80	4·79
Breadth (B)	2·80	3·50	3·185
L/B			1·5039

TABLE 2

SAMPLEWISE (AND ALSO STRATIGRAPHIC) OCCURRNCE OF DIFFRENT PLANT REMAINS AT TULJAPUR GARHI

Sr. No.	Plant Remains	Tr. A6, Qd. I Pit.	Tr. XC 1, Qd. II sealed by humns Pit No. 1	Tr. XA4, Qd. I Pit No. 4, sealed by Layer (2)	Tr. A4, Qd. II Pit No. 5, sealed by Layer (1)	Tr. A6, Qd. I Pit sealed by Layer (2)	Tr. A3, Qd. III Layer (3)	Tr. A6, Qd. I Pit III sealed by humus	Tr. A4, Qd. III Pit No. 5, sealed by humus	Tr. A4, Qd. III Pit No. 5, sealed by humus	Areas of Origins of domestication	Cropping seasons and related remarks.
1.	Rice (*Oryza* sp. c.f. *sativa* Linn.)	+	–	+	+	–	+	+	–	–	India (Mainly SE Asia, China,	Summer/Winter crop
2.	Great/millet (*Sorghum bicolor* Mill sp.)	+	–	–	–	–	–	+	+	–	Africa	Introduced, Summer rainfed
3.	Wheat (*Triticum* sp. cf *aestivum* Linn.)	+	–	–	–	–	–	–	–	–	West Asia	Introduced, Winter
4.	Barley (*Hordeum vulgare* Linn.)	–	–	–	+	–	+	–	–	–	*	Introduced, Winter
5.	Blackgram (*Vigna mungo* (L.) Hepper	–	–	–	–	+	–	+	–	–	India	Indigenous Summer (Monsoon)
6.	Green gram (*Vigna radiata* (Linh.) Wilczek	–	–	–	–	–	+	–	–	–	*	Indigenous, Summer
7.	Black gram/Green gram (*Vigna* sp.)	+	–	–	–	+	+	–	–	–	*	*
8.	Hyachinth bean (*Delichos lablab* Linn.)	–	–	+	+	–	+	–	–	–	*	*
9.	Horse-gram (*Dolichos biflorus* Linn.)	–	–	–	–	–	+	–	–	–	*	*
10.	Lentil (*Lens esculenta* Moench.)	–	+	+	+	–	+	–	–	–	West Asia	Introduced Winter pulse
11.	Grass pea (*Lathyrus sativus* Linn.)	–	–	–	–	–	–	+	–	–	West Asia	Introduced, Winter pulse
12.	Gram (*Cicer arietinum* Linn.)	–	–	–	–	–	–	+	–	–	West Asia	Introduced, Winter pulse
13.	Pigeon pea (*Cajanus cajan* Mills p.)	–	–	–	–	–	–	+	–	–	Western India	Indigenous Summer crop
14.	Kenaf (Deccan Hemp, Bimli jute) or ? Roeselle or ? *Hibiscus* sp. cf *cannabis* Linn) or ? *Hibisous* cf *sabadariffa* Linn.)	+	–	–	+	–	–	–	–	–	Africa ?	Introduced ? Summer crop
15.	Babul (*Acacia nilotica* (L.) Del.	–	–	–	–	–	+	–	–	–	Africa, India (Naturalised)	Wildl growing in dry plains of India, especially Docan
16.	*Brassica* type – (circular)	–	–	–	–	–	–	+	–	+		
17.	Indeterminate/large plump (single) (Type A)	–	–	–	–	–	–	+	–	–		
18.	Indeterminate/large, flat (single) Type B.	–	–	–	–	–	–	–	+	–		

In general barley grains are poorly preserved and show artefacts of carbonisation.

(3) WHEAT : *Triticum* sp. (pl. XV, 9–10)

A few poorly preserved grains with dorsal dome and basal embryonal position could be detected. Ventral periclinal groove could be observed.

Table of measurements in mm (four grains from sample: Trench A6, Qd. I, Pit 2)

	Length (L)	*Breadth (B)*	*Thickness (T)*
	4·80	2·50	2·50
	4·70	2·90	2·50
	4·80	2·90	2·30
	4·10	3·10	2·40
Mean	4·60	2·85	2·425
L/B	1·6140		
L/T	1·896		
B/T	1·8969		

(4) GREAT MILLET (SORGHUM, JOWAR) : *Sorghum bicolor* Millsp. (pl. XV, 11-15)

The grains are found in lumps as well as separately. A tarlike mass is formed during the process of carbonisation. The individual grains have embeded in the tar like mass. The individual grains are often difficult to separate. Their impressions as well as cast could be observed in the shining mass. The grains are roundish with characteristic embryonal area and extending upto one half the length of the grains. On ventral side, a sloping area could be observed.

Table of measurements in mm (26 grains from sample: Trench Qd. I, Pit 2, S.B. Humus)

	Minimum	*Maximum*	*Mean*
Length (L)	2·40	4·10	3·462
Breadth (B)	2·5	4·9	3·836
Thickness (T)	1·8	4·9	2·4730
L/B			0·9043
L/T			1·4028
B/T			1·5511

(5) BRASSICA type : BRASSICA sp. (pl. XV, 19–21)

A few lumps of grains could be observed. Individual grains show a thin seed coat with characteristic rugose surface ornamentation reminding that of *Brassica* type. The grains are nearly circular. Two dimensions are noted for each grain and their mean is to be taken as the diameter.

Table of measurements in mm (one hundred grains from sample: Trench A4, Qd. III, Pit 5, S.B. Humus)

Table of measurements in mm (one hundred grains from Tr. A4, Qd. III, Pit 5, S.B. Humus)

	Minimum	*Maximum*	*Mean*
Diameter I (D1)	1·15	1·80	1·4150
Diameter II (D2)	1·05	1·70	1·3029
Diameter			1·35895

(6) ?BIMLEY JUTE (DECCAN HEMP) ?ROSELLE : ? *Hibiscus* sp. cf *cannabis* Linn/ ?*Hibiscus* sp. cf *sabdariffa* Linn. (pl. XV, 23–26)

The grains are characteristically anglular reminding malvaccous affinities. One side is angular while the other end is roundish. In between the two ends hylum scar is to be noted in a concavity while the opposite side is convex. The seeds of Bimley jute (Deccan hemp) and Roselle show considerable similarities and hence the ancient seeds are only tentatively diagnosed.

Table of measurements in mm fourteen grains from sample: Trench A6, Qd. I, Pit 5.

	Minimum	*Maximum*	*Mean*
Length (L)	3·20	4·00	3·6821
Breadth (B)	1·90	2·55	2·414
L/B			1·5253

7. PIGEON PEA : *Cajanus cajan* Mill sp. (pl. XV, 31–36)

Few grains as well as split cotyledons are found. The hylum scar is lost during the carbonisation. The grains are plump, squarish-roundish. Their measurements are as follows in mm. (Sample : Trench A6, Qd. I, Pit 2).

	Length (L)	*Breadth (B)*	*Thickness (T)*	*L/B*	*L/T*	*B/T*
Grains	5·00	3·70	3·00			
	4·90	3·85	3·60			
Mean	4·95	3·775	3·30	1·31	1·5	1·143
Cotyledons	4·70	3·80				
	5·80	5·20				
	6·00	5·00				
	5·20	4·65				
	4·85	4·00				
Mean		4·53		1·172		
	5·34					

(8) GRAM (CHICK PEA) : *Cicer arietinum* Linn. (pl. XV, 27–28)

Split cotyledons with a characteristic hylum scar noted but the beak is lost during the process of carboni sation. They measure 4·10 × 3·55 mm and 4·8×4 mm.

(9) HYACINTH BEAN : *Dolichos lablab* Linn. (pl. XV, 29–30)

Kidney shaped split cotyledons observed. One of them shows charactristic plumule impression. It measures 5·60×4·80 mm.

(10) LENTIL : *Lens esculenta* Moench. (pl. XVI, 1–4)

The grains are biconvex, more or less circular with keeled margin (radicle). Seed coat is lost in most of the grains due to carbonisation. Split cotyldons are also noted.

Table of measurements in mm thirty grains from Sample : Trench Qd. III, Pit 5, S.B. Layer (1)

	Minimum	*Maximum*	*Mean*
Diameter D1	2·50	4·10	3·2116
Diameter D2	2·25	3·80	3·283
Diameter			3·2473

Table of measurements in mm (twenty-eight grains from Trench XC1, Qd. II. S.B. Humus, Pit 1)

Diameter D1	2·75	4·10	3·0428
Diamter D2	2·00	3·70	3·01071
Diameter			3·026755

(11) GRASS PEA : *Lathyrus sativus* Linn. (pl. XVI, 5–8)

Few angular grains with squat margins are noted. A couple of split cotyledons are also observed. They measure as follows in mm.

Grains – 3·4 × 2·8, 4·5 × 3·4, 4·6 × 3·50 and the cotyledon 4·85 × 3·35

(12) BLACK GRAM : *Vigna mungo* (L.) Hepper (pl. XVI, 9–14)

Intact grains as well as split cotyledons are noted. The grains are plump, longish with roundish margin. The split cotyledon show hylum scar in lateral view and the plumule which extends upto one half the length of the cotyledons.

Table of measurements in mm ten grains from Sample: Trench A6, Qd. I, Pit S.B. (2) .

(1) entire grains

	Minimum	*Maximum*	*Mean*
Length (L)	3·10	3·90	3·33
Breadth (B)	2·60	3·00	2·75
Thickness (T)	2·10	2·60	2·37
L/B			1·210
L/T			1·40
B/T			1·160
(B) Split Grains (fourteen cotyledons)			
Length (L)	3·40	3·90	3·515
Breadth (B)	2·00	2·75	2·538
L/B			1·3849

(13) GREEN GRAM : *Vigna radiatus* (L.) Wilczec. (pl. XVI, 19–25)

Intact grains as well as split cotyledons noted. The grains are plump, bit longish but not as much as black gram. They show artefacts of carbonisation leading to the splitting of the grains. The separated cotyledons show plumule. Few smaller grains also exist in the collection. It is not certain if they belong to the wild strains of green gram.

Table of measurements in mm nineteen grains from Sample : Trench A3, Qd. III, Layer (3).

	Minimum	*Maximum*	*Mean*
Length (L)	2·20	3·20	3·0473684
Breadth (B)	2·00	2·80	2·671052
Thickness (T)	1·75	2·20	2·2815
L/B			1·140887
L/T			1·3356863
B/T			1·17074

Table of measurements of *Vigna* sp. in mm Sample: Trench A6, Qd. I, Pit 2.

Length (L)	2·75	3·50	3·144
Breadth (B)	1·95	2·880	2·344
L/B			1·3412

(B) Split grains (seven cotyledons)

	Minimum	*Maximum*	*Mean*
Length (L)	2·85	3·80	3·328
Breadth (B)	2·10	2·55	2·2571
L/B			1·4744

(14) HORSE GRAM : *Dolichos biflorus* Linn. (pl. XVI, 15–18)

A few flattish grains with round outline are noted. A few show characteristic linear and slightly protruding hylum scar. Few split cotyledons are also observed. The grains from sample : A3, Qd. III, Layer (3) measure as follows in mm.

	Length (L)	*Breadth (B)*	*Thickness (T)*	*L/B*	*L/T*	*B/T*
	3·20	2·05	1·20			
	4·5	3·20	1·70			
	3·8	2·40	1·50			
Mean	3·83	2·55	1·46	1·5010	2·623	1·746

(15) BABUL : *Acacia nilotica* (L). Del. (pl. XVI, 26–29)

Intact grain showing a thin seed coat with a faint marginal line is noted. A single piece of separated seed coat with a distinct marginal line is also noted. The grain measures 4·5 × 4 mm.

(16) INDETERMINATE TYPE A : Only a single plump grain was found. One end is roundish and slightly thinning and slopping towards the opposite end. It measures 5·45 × 3·85 × 2·80 mm (pl. XVI, 30–31).

(17) INDETERMINATE TYPE B : A flat single seed found. One end is broad, the other end is tapering and angular. It measures 4·5 × 2·8 mm (pl. XVI, 32–33).

CONCLUSION

It may be inferred from the radiocarbon dates and pottery sequence from this site as well as other extensively excavated sites like Inamgaon, Daimabad, etc. that the plant remains belong to the first millennium BC. It is clear that the ancient farmers practiced agriculture in two seasons. They cultivated winter crops (wheat, barley, lentil, grass pea, gram) as well as summer crops (rice, great millet, hyachinth bean, horse gram, pigeon pea, black gram, green gram). They also raised (?) Kenaf (Deccan Hemp) / ? Roselle for exploitation of fibers and vegetable, as can be guessed from their ethnographic parallels. In view of the difficulties in separating seeds of these two species, the identification has been carried out only upto generic levels. This is the first evidence of seeds which can be assigned to Kenaf/Roselle from an Indian archaeological site, although the author has detected some malvacesous seeds (*Abutilon* sp.) from other chalcolithic sites like Inamgaon and Daimabad, from the levels assignable to second millennium BC.

The occurrence of seeds of *Babul* is interesting. This is the 2nd occurrence of seeds of this species from Deccan. The author has observed *Babul* seeds from palaeoethnobotanical collection from Imamgaon (1600-700 BC) in Maharashtra. Pods of Babul have also been reported by Chowdhury *et al* (1977) at Atranjikhera in Etah district of Uttar Pradesh. This is a tree species found in dry plains of India, especially in the Deccan. The pods are valuable source as a fodder, bark is used

as tan. The gum obtained from the bark is used in the confectionary and baskets are made of young twigs.

The occurrence of grains of great millet and pigeon pea is an extremely valuable addition to the farming economy of Jorwe culture, especially in its later phases. of these two, the first one introduced into India from Africa during the end of third millenium BC sites like Harappan Rohira in Punjab (Saraswat, 1985), Jorwe levels at Daimabad (Kajale 1977 b) and also Savalda levels at Daimabad (personal observation). The pigeon pea has more or less exclusively Indian archaeobotanical record such as an Megalithic Bhagimohari (Kajale 1988), Satavahana to Indo-Roman levels of Bhokardan (Kajale, 1973), Indo-Roman Nevasa and Historical Mungi (Kajale 1974). Looking at its natural diversity and distribution of the wild relatives of Pigeon pea (such as *Atylosia* spp.) it is clear that the Pigeon pea must have been domesticated in western India.

Most of the cultivated cereals and pulses except Pigeon pea have come to light from Chalcolithic Inamgaon (1600–700 BC) (Kajale 1977 a and 1979) and Daimabad (Kajale 1977 b) during middle phase of second millennium BC. Thus the present materials from Tuljapur Garhi is an extremely important addition to the chalcolithic (especially the later phase) economy of the Deccan. Posterior to this, we have an important well dated evidence of crop plants from Megalithic site (800 to 400 BC) of Bhagimohari (Kajale 1988). From district Amravati, an Early historical site at Bhatkuli, evidence for great millet and gram has come to light (Vishnu Mittre and Gupta 1966). Thus we are now getting an integrated picture of exploitation of wild and cultivated species during entire period of first millenimum BC in Vidarbha region of Maharashtra.

Acknowledgements

The author is thankful to Shri B.P. Bopardikar, former Superintending Archaeologist at the Prehistory Branch of Archaeological Survey of India, for entrusting the materials for scientific investigations. Sincere thanks are due to the authorities of the University Grants Commission, New Delhi for sanctioning a short–term (minor) research project to the author during 1983-85. Thanks are also due to Prof. M.K. Dhavalikar, former Director, Deccan College, Postgraduate Research Institute, Pune for encouragement and laboratory facilities. Shri V.K. Nagpure's assistance in photographic printing is thankfully acknowledged.

References

1. K. A.Chowdhury , K.S. Saraswat and G.M. Buth, *Ancient Agriculture and Forestry in North India* (Bombay) (1977).

2. M.D. Kajale, "Plant Economy at Bhokardan". S.B. Deo and R.S. Gupte (Eds.) *Excavations, at Bhokardan (Bhagavardhana) 1973*, Nagpur University and Marathwada University, (1973) pp. 217–224.

3. M.D.Kajale , "Ancient Grains from India," *Bulletin Deccan College Research Institute*, 34 (1–2), (1974), pp. 55–74.

4. M.D.Kajale , "Ancient Plant Economy at Inamgaon," *Man and Environment*, Vol. 1 (1977), pp. 54–56.

5. M.D.Kajale , "On the occurrence of Botanical Findings from Excavations at Daimabad, a Chalcolithic site in Western Maharashtra, India," *Current Science*, Vol. 46 (23), (1977), pp. 818–819.

6. M.D.Kajale , 1979. Bioarchaeology of Ghod Valley, Maharashtra. Unpublished Ph. D. Thesis submitted to the University of Poona, (Pune, 1979)

7. M.D.Kajale , "Ancient Plant Economy during Megalithic period at Bhagimohari, District Nagpur, Maharashtra," Paper presented at the Special Geophytological Conference held at Pune during 27th to 29th November 1986.

8. S.K.Saraswat , "Pre–Harappan Food Economy at Rohira, District Sangrur, Punjab (c. 2300–2000 B.C.)", Paper presented at the conference of Indian Archaeological Society (New Delhi, 1985)

9. Vishnu Mittre and H.P. Gupta, "Plant Remains from Ancient Bhatkuli, Dist. Amaraoti, Maharashtra", *Puratattva*, 2 (1966), pp. 21–22.

Description of Plates

Plate XV

1 to 3 – Rice (*Oryza* sp. *ativa* Linn.)

(1) General view of the grains.

(2) Close view of the grain showing vertical ridges alternating with furrows and lateral appearance of embryonal position.

(3) Close view of the grains, on the right hand grain artefact of carbonisation is noted.

4 to 8 – Barley (*Hordeum vulgare* Linn.)

(4) General view of the grains.

(5) Three grains, left one in dorsal view, middle one in lateral view and the left one showing the ventral view.

(6) Dorsal view of the plump grain, probably plumpness resulting from carbonisation.

(7) Poorly preserved grains, yet clear enough for diagnosis.

(8) Ventral view of the plump grain.

9 and 10 – Wheat (*Triticum* sp. cf *aestivum* Linn.) showing dorsal and ventral views.

11 to 15 Great millet (*Sorghum bicolor* Mill sp.).

(11) Carbonised lump of grains showing embeded grains in a tar like mass along with their casts.

(12) Separated grains showing embryonal portion.

(16) General view of the grains showing ventral side.

(17) Two enlarged grains, note the prominent embryonal area.

(18) Two grains, ventral view, note the flat slanting nature.

19 to 21 *Brassica* morphotype

(19) Lump of grains.

(20) and (21) separated grains with prominent surface ornamentation of seed coat.

(22) General view of the lump of modern "Good–dani" (local name for an item of food consumed on fasting days prepared out of grain Amaranth (*Amaranthus paniculatus* Linn.). This shows only an apparent similarity with (19) but not the botanical affinity at all.

23 to 26 ? Kenaf (Bimali Jute, Deccan Hemp) / ? Roselle

? (*Hibiscus* sp. cf *cannabis* Linn. /

? (*Hibiscus* sp. cf *sabdariffa* Linn.)

(23) General view.

(24) Single grain showing curved hylum scar.

(25) Top view of the hylum scar.

(26) Top grains showing sub-angular nature of the grains.

27 and 28 – Gram (*Cicer arietinum* Linn.)

(27) Upper surface of cotyledon.

(28) Inner surface of cotyledon.

29 and 30 – Hyacinth bean (*Dolichos lablab* Linn.)

(29) Inner surface of cotyledon.

(30) Inner surface of cotyledon, note the embryonal impression.

31 to 36 Pigeon pea (*Cajanus cajan* Mill sp.)

(31) General view of the grains.

(32) Top view of the seed.

(33) and (36) Upper view of the poorly preserved cotyledon.

(34) and (35) Inner view of the cotyledon.

Plate XVI

1 to 4 – Lentil (*Lens esculenta* Moench.)

(1) General view of the grains.

(2) Close view showing keeled margin of the grains.

(3) Two grains enlarged, note the artefact of carbonisation.

(4) Two cotyledons, left one showing impression of plumule, the right hand one showing the plumule itself.

5 to 8 – Grass pea *(Lathyrus sativus* Linn.)

(5) and (6) Two grains showing angular and squat nature.

(7) Outer surface of the cotyledon.

(8) Inner surface of the cotyledon.

9 to 14 – Black gram (*Vigna mungo* (L.) Hepper)

(9) Two grains showing general view.

(10) Cotyledon of black gram, note the plumule.

(11) General view of the inner surface of the cotyledons.

(12) Two cotyledons showing the inner surface, note the plumule.

(13) and (14) Cotyledon of black gram, note the plumule.

15 to 18 – Horse gram : *Dolichos biflorus* Linn.

(15) General view of the grains.

(16) Grains, upper one a cotyledon and the lower one showing artefact of carbonisation.

(17) Side view of the single grain showing hylum scar.

(18) Top view of the hylum scar.

19 to 25 – Green gram (*Vigna radiatus* Linn.) Wilczek)

(19) General view of the grains.

(20) General view of the split cotyledon.

(21) Enlarged view of the split cotyledons.

(22) Single cotyledon showing straight plumule.

(23) General view of those grains showing artefacts of carbonisation, leading to the split cotyledons.

(24) Outer sufface of the cotyledon.

(25) Inner surface of the cotyledon showing slightly curved plumule.

26 and 27, 28 and 29 *Babul* (*Acacia nilotica* (L.) Del.)

(26) and (27) Poorly preserved grains, earlier one showing one surface, the later one showing the obverse surface, partly eroded because of carbonisation.

(28) Outer surface of the seed coat, note the characteristic marginal line.

(29) Inner surface of the seed coat.

(30) and (31) General view of the unidentifiable grain, two opposite surfaces.

(32) and (33) Unidentifiable grain (flattish, long type). Two opposite surfaces.

APPENDIX III

ANIMAL REMAINS FROM TULJAPUR GARHI

P.K. Thomas *

Tuljapur Garhi a Chalcolithic site (21° 20' N; 77° 35' E) is situated on the right bank of the river Purna, a tributary of Tapti, in the Amravati district of Maharashtra. This site is excavated in 1984–85 by the Excavation Branch of the Archaeological Survey of India, Nagpur under the direction of B.P. Bopardikar. The mound measures 210 m north–south and 90 m east–west. A cultural deposit of 1·5 m in four layers have been encountered at Tuljapur Garhi. The entire deposit belongs to the chalcolithic period however, on the basis of pottery layers 1 and 2 could be assigned to sub-phase Jorwe and layers 3 and 4 to Malwa.

The artefacts include a variety of wheel-made pottery with painted designs, steatite beads, beads of terracotta and semiprecious stones, microliths and bone points. Copper objects such as rings, bangles and fish hooks are found only in the Jorwe phase. Elliptical and circular house plans have also been traced in both phases at Tuljapur Garhi (B.P. Bopardikar, personal communication).

Animal remains collected from all the four layers are included in the present study. There is no uniformity in the collection as the area excavated varies considerably in different layers. For instance, in layer 1, the animal remains are available from 27 squares, layer 2 from 16 squares, layer 3 from 9 squares and in layer 4 from 2 squares. Heavy fragmentation due to human activity is noticed on the faunal assemblage. A majority of the bones were encrusted with the deposit. Thus the bones were subjected to mechanical and chemical cleaning.

METHODOLOGY

The identification of bones is carried out with the help of the reference skeletons of modern domestic and wild animals available at Deccan College. In order to study the composition of animals in different layers the faunal material from all the four layers have been studied separately. The distribution of animal remains in each layer is plotted on a table. For economic interpretation of the ancient populations the animal remains have to be quantified. Many methods are employed in the quantification however, because of the smaller size of the sample the total counts of the identifiable bones of each species is taken into consideration. Here the vertebrae and ribs are not included since,

* Department of Archaeology, Deccan College, Post graduate and Research Institute, Pune.
A part of this article appeared in *Man & Environment*, Vol. XVII, No. 2, (1992).

they cannot be identified with certainty. The frequency of animals has been worked out for each layer. The age of the animals at death is calculated by the eruption and wear of the teeth and also by the epiphyseal fusion of long bones.

Fourteen species of animals are identified at Tuljapur Garhi which include mammals, birds, reptiles and molluscs. Among the mammals the cattle, goat, dog and ass are domesticated animals. The entire fauna represented at Tuljapur Garhi is as follows :

Mammals

1. *Bos indicus* (cattle)
2. *Capra hircus* (goat)
3. *Canis familiaris* (dog)
4. *Equus asinus* (ass)
5. *Tetracerus quadricornis* (four-horned antelope)
6. *Axis axis* (chital)
7. *Axis porcinus* (hog deer)
8. *Sus scrofa cristatus* (wild pig)
9. *Herpestes edwardsi* (mongoose)
10. *Rattus rattus* (common house rat)

Birds

11. *Gallus* sp. (fowl)
12. *Ardeotis nigriceps* (the great indian bustard)

Reptile

13. *Chitra indica* (soft shelled river turtle)

Molluscs

14. *Lamellidens sp.* (bivalves)

DOMESTIC ANIMALS

Bos indicus (cattle) : Cattle is the most predominant animal in the Chalcolithic culture at Tuljapur Garhi. This animal is identified from all the layers by their appendicular and axial skeletons (Tab. 1–4). The long bones like humerus, radius, femur and tibia are almost equally represented in the collection. They are identified by their proximal and distal epiphyses (pl. XVII A). Glenoid cavity of the scapula is frequently found and cut marks are observed on the neck region of the scapula (pl. XVII B). The proximal end of humerus and distal end of femur are more vulnerable to natural

and human destruction, hence they are scarce in the collection. Pelvis is identified by its acetabulum. Metacarpal and metatarsal fragments are quite numerous and are represented by their proximal and distal ends, frequently with long shafts (pl. XVIII A). A large number of teeth belonging to both upper and lower jaws are collected (pl. XVIII B). The phalanges, carpals and tarsals are smaller and sturdy bones, and are found well preserved in the collection (pl. XIX). There is a great deal of fragmentation of long bones. Majority of these splinters and chips could not be identified. Butchering marks are observed on long bones.

Cattle is preferred by the inhabitants for meat at an young age. The unfused proximal end of femur and the mandibles (pl. XX A) bearing just erupted or erupting 3rd molars indicate that a majority of the cattle were killed before the age of 3 years. However, a few worn out dentition of old animals are also found in the collection. Probably cattle were also kept for agricultural and other operations. The bones of this animal are more than 70% in all the layers (Table 5). The first three layers are more consistant than the last layer. In layer 4, the frequency is 91·53%, and this overrepresentation may be due to the smaller area excavated in this layer. However, the high frequency of cattle in all the layers suggests the economic importance of this animal in the Chalcolithic culture at Tuljapur Garhi.

Capra hircus (goat) : Bones of goat are found in the first three layers at the site. Their absence in layer 4 cannot be confirmed at present. They are represented 14·16%, 8·68% and 8·99% in layers 1, 2 and 3, respectively (Table 5). Maximum number of bones are identified in layer 1 which include both appendicular and axial skeletons (pl. XX B). The high frequency in layer 1 has to be noticed. The long bones are represented by both the epiphyses, frequently with cut marks on the diaphyses. The medial and lateral epicondyles of the distl end of humerus are separated out by cutting at the middle of the capitulum. The glenoid cavity of scapula is better preserved and the scapula blade is cut at its neck region. This animal was not in the daily diet of the people. Goat was the second most important animal in the food economy of the inhabitants.

Canis familiaris (dog) : Dog is known as the companion of man right from the prehistoric times. This animal is associated with the Chalcolithic culture at Tuljapur Garhi. Dog bones are identified from all the 4 layers by metapodials and parts of jaw. In layer 1, a complete left mandible is found. (pl. XXI A, 1). Since this animal was not in the diet of the people we cannot expect all the bones, unless it is a burial in the living area. These small bones must have been brought to the settlement by the scavengers.

Equus asinus (ass) : Ass is known as a beast of burden from the protohistoric cultures of India. Three lower jaw teeth and a fragment of the metacarpal are identified in layer 1 (pl. XXI A, 2–5). Two of the teeth are the second and third premolars and the third one may be a molar. This animal is a later introduction into the chalcolithic culture at Tuljapur Garhi.

WILD ANIMALS

Among the wild animals the four–horned antelope (*Tetracerus quadri cornis*) was a major source of subsitence for the inhabitants. This animal is identified 1·62%, 5·10%, 7·87% and 6·78%

in Layers 1, 2, 3 and 4, respectively. The bones belong to both appendicular and axial skeletons (pl. XXI B, 1–4). Chital (*Axis axis*) was the next important wild animal in the food economy. This animal is identified from the first three layers 1–3. Antler fragments, long bones and teeth are common in the collection (pl. XXII A). These animals were widely distributed in ancient times as they are reported from a vast majority of archaeological sites (Thomas, 1974).

Axis porcinus (hog deer) is not frequently found in the archaeological context. This animal is represented in layer 1 at Tuljapur Garhi by 15 bones (Table 6). A typical antler fragment of the hog deer is found in the collection (pl. XXI B, 5 – 8). This was broken just above the '*burr*' region and was probably used a tool, as it was rightly cut from the frontal bone. The antler of *Axis porcinus* differs from that of *Axis axis* in its slenderness, the elongated bony pedicel and a straight main beam. The inhabitants of Tuljapur Garhi also hunted wild pigs (*Sus scrofa cristatus*). They are found only in the first three layers and mostly identified by mandible and maxilla fragments (pl. XXII B). The absence of long bones is rather intriguing. One of the changes that had taken place in this animal due to domestication is the general reduction in the size. Because of the considerable shortening of the snout region of the skull, the teeth are also became smaller both in the upper and lower jaws of the domestic pigs. The canine and molars identified at the site show the characters of typical wild pigs.

Mongoose (*Herpestes edwardsi*) has also contributed to the food economy of the inhabitants. This animal is identified by a scapula and a fragment of mandible in layer 1 (pl. XXIII, 8 – 9). Because of the smaller size of the animal they are seldom found in the archaeological exavations (Thomas, 1984). The common house rat (*Rattus rattus*) is a burrowing animal and is found almost every where in the archaeological deposits (Thomas, 1975). A mandible of this animal is found in layer 1 and is completely intact. The rat bone at Tuljapur Garhi also may not be contemporary with the Chalcolithic culture, rather later intrusive into the deposit.

Two species of birds are identified at the site. The bones of great Indian bustard (*Ardeotis nigriceps*) are found in layer 2 and fowl (*Gallus* sp.) in layer 1 (pl. XXIII, 1 – 7). The great Indian bustard is identified by its long bones while the bones of fowl were very fragmentary which include eiphyses of long bones.

It appears that the turtle meat was also occasionally relished by the inhabitants. The solitary evidence is noticed in layer 1 by a carapace fragment of the river turtle (*Chitra indica*). It is not certain that the shells identified (*Lamellidens* sp.) at Tuljapur Garhi were food refuse. However, they are edible and used by many people even to-day. Any other use of these shells at the site is not known.

The Chalcolithic mound being in the close vicinity of the Purna river one would expect fish remains from the site. However, no fish bones are found in the collection. A number of worked bones and bone tools are found at Tuljapur Garhi (pl. XXIV). A detailed study of the bone tools has yet to be done.

DISCUSSION AND CONCLUSION

The faunal assemblage from Tuljapur Garhi is studied in their entirety. According to the excavators two main cultural phases could be distinguished at the site, i.e. Malwa and Jorwe. The faunal composition of Jorwe phase cannot be compared with that of Malwa, since the faunal collection of the latter phase is restricted to 11 squares as compared to 43 in Jorwe. So the absence of animals like goat, pig, smaller mammals, birds and reptiles in the Malwa phase cannot be confirmed at present.

As in the other protohistoric cultures of India, the humped Indian cattle is the most predominant animal at Tuljapur Garhi. Only at Inamgaon, a chalcolithic site in Maharashtra, during the late Jorwe phase the sheep / goat bones out numbers those of cattle. So far, this is a solitary evidence for the predominance of another domestic animal in the Chalcolithic cultural phase (Thomas 1984 a). At Tuljapur Garhi cattle is killed for food both in the Malwa and Jorwe phases. Although, there are no direct evidences, in addition to the supply of meat cattle may have also helped the early populations in many ways. The by - products like milk, dung and hide are economically very valuable and the Chalcolithic inhabitants were possibly aware of the utility of these materials. Cattle must have helped in the agricultural operations. The introduction of wheeled cart is associated with the domestication of cattle. The terracotta wheeled toy cart at Mohenjodaro is shown pulled by bullocks (Allchin 1968). A similar evidence is also reported at Inamgaon (Dhavalikar 1974). These evidences suggest the use of cattle for traction from very early times in India.

Another point of interest is the considerable increase in the frequency of goat bones in layer 1, compared to the other layers at Tuljapur Garhi. The introduction of ass (*Equus asinus*) is also noticed in this layer. A more or less similar situation is found during the late Jorwe phase at Inamgaon. The changes in the composition of animals in this phase and with all the other related evidences, it is inferred that aridity during 1000 BC enforced a part of the population at Inamgaon for nomadic way of life. At present nothing can be certainly presumed from the finds at Tuljapur Garhi, unless the site is extensively excavated.

Dog (*Canis familiaris*) remained as a companion of the Chalcolithic man through out the cultural history at Tuljapur Garhi. This animal must have guarded the settlement and domestic herds of the inhabitants. The use of dog in the hunting activities of man is well known.

Among the hunted animals the four-horned antelope (*Tetracerus quadricornis*) is consistant and is found in all the layers. Chital (*Axis axis*), hog deer (*Axis porcinus*) wild pig (*Sus scrofa cristatus*), mongoose (*Herpestes edwardsi*), the great Indian bustard (*Ardeotis nigriceps*), fowl (*Gallus* sp.) and the river turtle (*Chitra indica*) are other wild animals represented at Tuljapur Garhi. The proportion of domestic to wild animals is approximately 4:1. So the wild mammals, aquatic and avian fauna identified at the site must have substantiated the food economy to a considerable extent. Although there is no evidence of fish bones from the site, which being in the bank of river Purna, fishing must have been another activity of the early population like hunting and trapping. The identification of these wild animals suggests a scrub jungle with open space during the occupation of the site.

APPENDIX III

The major fragmentation of the bones collected at the site is due to human activity on them. A large number of small fragments could not be identified. Cut marks are observed on the proximal and distal diaphyses of long bones. A very sharp metal instrument must have been used to cut these bones. Charring is found only on a few bones. This indicates defleshing the animal before cooking the meat. Butchering marks are found on the long bones very near to the articular surfaces. Worked bones and bone tools are collected from all the layers. They need further detailed study for reporting. The points and scrapers are more among the bone tools. Mainly chipping and grinding are the techniques employed in the manufacture of these tools. Occasionally the points are fire hardened at the tips.

ACKNOWLEDGEMENT

I am thankful to B.P. Bopardikar, Superintending Archaeologist of the Archaeological Survey of India, Nagpur, for entrusting me with the faunal remains from Tuljapur Garhi.

References

B & R Allchin, "*The Birth of Indian Civilization* (England, 1968), pp. 304

M.K. Dhavalikar,"Subsistence pattern of an early farming community of western India", *Puratattva*, 77 (1974), pp. 39 – 56.

P.K. Thomas, "Zoological evidence from prehistoric India, with special refernce to domestication", *Bulletin of the Deccan College Research Institute*, Vol. XXX IV / 1 – 4 (1974), pp. 195 – 210.

P.K. Thomas, "Role of animals in the food economy of the mesolithic culture of western and central India," (A.T. Clason ed.) *Archaeozoological Studies* (Amsterdam, 1975), pp. 322 – 328.

P.K. Thomas, "Faunal asemblage of Veerapuram," (T.V.G. Sastri, *et al*) *Veerapuram a type site for cultural study in the Krishna Valley*, (Hyderabad, 1984), Appendix C, i – xi.

P.K. Thomas, The faunal background of the chalcolithic culture of western India," (J. Clutton-Brock & C. Grigsoned). *Animals and Archaeology Vol. 3 British Archaeological Report 202*, (England, 1984), pp. 355 – 361.

TABLE 1
Distribution of identifiable bones of animals in Layer 1

	Horn/Antler	Scapula	Humerus	Radius	Ulna	Pelvis	Femur	Tibia	Metacarpal	Metatarsal	Astragalus	Calcaneum	Centrotarsal	Carpal/& Tarsal	Phalanx	Mandible	Maxilla	L.J. Teeth	U.J. Teeth	Total	Remarks
Bas indicus (cattle)	8	14	14	9	7	10	8	10	27	29	7	4	4	23	40	34	—	34	28	310	
Capra hircus (goat)	—	7	6	3	2	5	5	2	6	4	2	1	—	4	2	4	—	4	4	61	
Canis familiaris (dog)	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	1	—	—	—	5	
Equus asinus (ass)	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3	—	4	
Tetracerus quadricornis (four-horned antelope)	—	1	—	1	2	—	—	—	—	—	—	—	—	—	—	—	—	2	1	7	
Axis axis (chital)	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	5	7	
Axis porcinus (hog deer)	1	4	2	—	—	2	—	—	1	2	1	—	—	—	1	1	—	—	—	15	
Sus scrofa cristatus (wild pig)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	4	
Herpestes edwardsi (mongoose)	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	
Rattus rattus (commonhouse rat)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	
Gallus sp. (fowl)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	Frags.
Lamellidens sp. (bivalives)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	Shells
																		Total		431	

TABLE 2
Distribution of identifiable bones of animals in Layer 2

	Horn/Antler	Scapula	Humerus	Radius	Ulna	Pelvis	Femur	Tibia	Metacarpal	Metatarsal	Astragalus	Calcaneum	Centrotarsal	Carpal/& Tarsal	Phalanx	Mandible	Maxilla	L.J. Teeth	U.J. Teeth	Total	Remarks
Bos indicus (cattle)	2	6	9	7	2	4	5	4	7	8	5	2	2	11	16	17	3	13	14	142	
Capra hircus (goat)	—	1	1	2	—	3	—	1	1	—	—	1	1	—	3	—	—	3	—	17	
Canis familiaris (dog)	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	1	—	—	—	3	
Tetracerus quadricornis (four-horned antelope)	—	1	2	3	—	2	1	1	—	—	—	—	—	—	—	—	—	2	1	10	
Axis axis (chital)	1	—	1	—	—	—	—	—	—	—	—	1	—	—	3	—	—	—	5	11	
Sus scrofa cristatus (wild pig)	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	3	1	—	5	
Ardeotis nigriceps (Indian bustard)	—	—	1	—	—	—	—	1	2	—	—	—	—	—	—	1	—	—	—	4	
Chitra indica (river turtle)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	cazapace
Lamellidens sp. (bivalives)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	Shells
																		Total		196	

TABLE 3
Distribution of identifiable bones of animals in Layer 3

	Horn/Antler	Scapula	Humerus	Radius	Ulna	Pelvis	Femur	Tibia	Metacarpal	Metatarsal	Astragalus	Calcaneum	Centrotarsal	Carpal/& Tarsal	Phalanx	Mandible	Maxilla	LJ. Teeth	UJ. Teeth	Total	Remarks
Bos indicus (cattle)	1	3	2	7	7	7	2	7	5	3	2	3	2	8	13	24	2	17	21	136	
Capra hircus (goat)	—	1	—	1	—	4	1	1	1	—	—	1	—	—	—	2	—	—	4	16	
Canis familiaris (dog)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	3	
Tetracerus quadricornis (four-horned antelope)	—	2	1	—	1	1	—	—	—	—	—	1	1	—	1	1	—	3	2	14	
Axis axis (chital)	—	—	1	—	1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	5	
Sus scrofa cristatus (wild pig)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	2	
Lamellidens sp. (bivalives)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	Shells
																		Total		178	

TABLE 4
Distribution of identifiable bones of animals in Layer 4

	Horn/Antler	Scapula	Humerus	Radius	Ulna	Pelvis	Femur	Tibia	Metacarpal	Metatarsal	Astragalus	Calcaneum	Centrotarsal	Carpal/& Tarsal	Phalanx	Mandible	Maxilla	L.J. Teeth	U.J. Teeth	Total	Remarks
Bos indicus (cattle)	—	5	5	2	2	3	2	1	3	2	—	1	—	4	1	6	—	3	14	54	
Canis familiaris (dog)	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	
Tetracerus quadricornis (four-horned antelope)	1	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	4	
																		Total		59	

TABLE 5

Frequency of identifiable bones of animals in Layers 1 – 4

Layers	(1)	(2)	(3)	(4)
Species	%	%	%	%
Bos indicus (cattle)	71·93	72·45	76·40	91·53
Capra hircus (goat)	14·16	8·68	8·99	–
Canis familiaris (dog)	1·16	1·53	1·69	1·69
Equus asinus (ass)	0·93	–	–	–
Tetracerus quadricornis (4–horned antelope)	1·62	5·10	7·87	6·78
Axis axis (chital)	1·62	5·61	2·81	–
Axis porcinus (hog deer)	3·48	–	–	–
Sus scrofa cristatus (wild pig)	0·93	2·55	1·12	–
Herpestes edwardsi (mongoose)	0·46	–	–	–
Rattus rattus (common house rat)	0·23	–	–	–
Ardeotis nigriceps (Indian bustard)	–	2·04	–	–
Gallus sp. (fowl)	2·55	–	–	–
Chitra indica (river turtle)	–	0·51	–	–
Lamellidens sp. (bivalves)	0·93	1·53	1·12	–

TABLE 6

Number of identifiable bones of animals in Layers 1 – 4

Layers	(1)	(2)	(3)	(4)
Species	Number of bones			
Bos indicus	310	142	136	54
Capra hircus (goat)	61	17	16	–
Canis familiaris (dog)	5	3	1	1
Equus asinus (ass)	4	–	–	–
Tetracerus quadricornis (four–horned antelope)	7	10	14	4
Axis axis (chital)	7	11	5	–
Axis porcinus (hog deer)	15	–	–	–
Sus scrofa cristatus (wild pig)	4	5	2	–
Herpestes edwardsi (mongoose)	2	–	–	–
Rattus rattus (common house rat)	1	–	–	–
Ardeotis nigriceps (Indian bustard)	–	4	–	–
Gallus sp. (fowl)	11	–	–	–
Chitra indica (river turtle)	–	1	–	–
Lamellidens sp. (bivalves)	4	3	2	–

Description of plates

Plate XVII A Cattle: 1 & 2 humerus; 3 femur; 4 & 5 radius; 6 tibia.

Plate XVII B Cattle: 1 & 2 pelvis; 3, 4 & 5 scapula.

Plate XVIII A Cattle: 1, 2 & 3 metatarsal, 3, 5, 6 & 7 metacarpal.

Plate XVIII B Cattle: Top row; upper jaw teeth; Bottom row: Lowerjaw teeth

Plate XIX A Cattle: Top row; Ist phalanges; Middle row; 2nd phalanges; Bottom row: 3rd phalanges.

Plate XIX B	Cattle: 1, 4, 7 & 8 centrotarsal; 2, 5 & 6 astragalus; 6 & 3 calcaneum.
Plate XX A	Cattle: 1–4 horn cores; 5 & 6 maxillary fragments; 7 – 9 mandibular fragments.
Plate XX B	Goat: 1 scapula; 2 humerus; 3 radius; 4 – 7 teeth, 8 femur; 9 & 10 astragalus; 11 pelvis.
Plate XXI A	Dog: 1 mandible; Ass: 2 metacarpal; 3 molar; 4 & 5 premolars.
Plate XXI B	Four-horned antelope: 1 horncore; 2 scapula; 3 humerus; 4 mandible.
	Hog deer: 5 antler; 6 scapula; 7 metacarpal; 8 femur.
Plate XXII A	Chital: 1 antler; 2 scapula; 3 humerus; 4 femur; 5 calcaneum; 6 centrotarsal; 7 1st phalanx; 8 2nd phalanx.
Plate XXII B	Wild pig: 1 – 5 teeth; 6 metacarpal.
Plate XXIII	Great Indian Bustard: 1 – 4 long bones; Fowl: 5 – 7 long bones; Mongoose: 8 mandible; 9 scapula.
Plate XXIV	Bone Tools and Worked bones.

APPENDIX IV

ANALYSIS OF ANTHROPIC SOILS FROM CHALCOLITHIC TULJAPUR GARHI

Bhaskar C. Deotare *

The chemical studies especially phosphate analysis was first introduced to archaeology by Arrhenius, a Swedish Scientist in 1931 by establishing the relationship between phosphate content of the soil and sites of human occupation. Later on, it was spread to the European countries and USA. At the end of last decade, phosphate technique was first time applied in India by the Deccan College, Pune. Uptill now 800 samples of anthropic soils (human affected soils because of its universal association with human activities) as well as about 200 samples of modern soils were analysed. The analytical data shows significant difference in phosphate content of occupation soils and modern soils.

Basically all soils contain a certain amount of phosphate which usually derived from phosphate mineral like apetite, organic matter etc. The enrichment of phosphorus in and around a settlement area is due to refuse derived from bone, meat, plants, urine and faeces of man and animals. The most important tendency of phosphorus is to get fixed with calcium in case of alkaline condition and with iron and aluminum in acidic condition. Due to this characteristic behaviour of phosphorus, it remains intact for a longer period of time and possibility of losses through oxidation, reduction and leaching, etc. is almost nil.

A part of organic carbon and nitrogen is lost through oxidation and leaching, even then these elements can be used as an indicator for determining various human activities in co-ordination with phosphate. (Proven, 1971). In order to determine the intensity of habitation, twenty seven samples of anthropic soils from the chalcolithic site of Tuljapur Garhi, in district Amrovati in Vidarbha region of Maharashtra, were analysed for pH, electrical conductivity, organic carbon and phosphorus.

The following observations can be made on the basis of analytical results presented in table 1.

1. pH represent the soil reaction and electrical conductivity gives an idea about the soluble salts content. Here all samples are having pH values more than 7 thereby indicating alkaline reaction of all the samples. In case of E.C. the values are varied from 0·03 to 5·00 suggesting variation in soluble salts content.

---

* Department of Archaeology, Deccan College, Postgraduate Research Institute, Pune.

2. Organic carbon is varied from sample to sample ranging from 0·126 to 2·982%. Sample No. 15 onwards, organic carbon content is very low except sample nos. 16, 18 and 19. The samples containing more than 1% organic carbon are also high in phosphorus content. The highest percentage of carbon is in sample no. 6 of ash indicating a storage place of organic material.

3. Regarding phosphorus content, a very high i.e. more than 0·4% is observed in sample nos. 1, 4, 5, 6, 8, 9, 13 and 16 together with high organic carbon. These high values are of good indication of intensed human habitation. Sample nos. 25, 26 and 27 from black soil and yellow silt are suppose to be control samples i.e. devoid of any human activities. The phosphorus content is less than 0·1%. Considering these values as from control or similar to normal soil, then sample nos. 11, 15, 17, 20, 23 and 24 contains identical phosphorus values to the control. Thus it can be said that these samples are from an area where human activities might have been minimum or almost nil. In other words, low phosphorus content is an indication of the low or negligible activities. (Joshi and Deotare, 1983). On the other hand, phosphorus content of the remaining samples containing more than 0·2% is the clear cut indication of human habitation. As stated earlier the eight samples which contains very high phosphorus suggest that there might have been intense human activities or the population size might have been relatively more than other samples.

4. Phosphorus is directly proportional to the intensity of habitation as can be observed from the analytical data. Together with phosphorus, organic carbon is also equally important. In case of control samples, organic carbon is very low confirming the low organic material and less or nil activities. A very high 0·52% phosphorus in sample no. 6 of ash is once again indicate the storage place.

TABLE 1

CHEMICAL ANALYSIS OF THE SOIL SAMPLES FROM TULJAPUR GARHI, DIST. AMRAVATI

Sl. No.	*Particulars*	*Layer*	*Trench*	*pH*	*E.C.*	*Organic carbon %*	*Phosphorus %*
1.	Anthropic soil	(1)	C1, I	7·7	5·0	1·175	0·43
2.		"	A5, I	8·9	0·45	1·050	0·24
3.		"	A1, I	8·2	0·27	0·945	0·37
4.		"	XD1, II	8·8	0·55	1·135	0·51
5.		"	ZA3, IV	8·9	0·95	1·290	0·46
6.	Ash	"	A4, III	8·6	0·40	2·982	0·52
7.		(2)	A1, I	8·0	0·36	0·987	0·34
8.		"	ZA3,IV	8·5	1·65	1·050	0·57

Sl. No.	Particulars	Layer	Trench	pH	E.C.	Organic carbon %	Phosphorus %
9.		"	XD1, II	8·0	3·5	1·050	0·51
10.		"	CII,I	7·6	5·0	0·892	0·37
11.		"	A5, I	8·5	0·95	0·630	0·09
12.		(3)	A1, I	8·0	0·30	0·798	0·27
13.		"	XD1, II	8·3	2·5	1·135	0·46
14.		"	C1, I	7·7	4·0	0·588	0·17
15.		"	A5, I	8·1	1·5	0·147	0·06
16.		"	ZA3, IV	8·2	2·3	0·588	0·40
17.		(4)	C1, I	7·5	4·0	0·168	0·07
18.		"	XD1, II	8·8	0·5	0·672	0·22
19.		"	A1, I	8·0	0·3	0·546	0·29
20.		"	A5, I	9·2	0·5	0·126	0·07
21.		"	ZA3, IV	7·8	5·0	0·386	0·14
22.		(5)	A1, I	8·0	0·25	0·315	0·20
23.		"	ZA3, IV	7·6	4·5	0·273	0·11
24.		"	XD1, II	8·8	0·5	0·302	0·11
25.	Basal black soil and yellow silt	(6)	A1, I	7·45	2·5	0·150	0·10
26.		"	XD1, II	9·1	0·5	0·140	0·08
27.		"	ZA3, IV	7·7	4·2	0·140	0·08

E.C. means Electrical Conductivity in milli mhos/cm

References

R.V. Joshi and B.C. Deotare, *Chemical analysis of archaeological deposits from India*, Deccan College Post Graduate and Research Institute, (Pune, 1983).

D.M.J. Proven, Soil phosphate analysis as a tool in Archaeology, *Norwegian Archaeological Review*, 4 (1971), pp. 37-50.

APPENDIX V

RESULTS OF RADIO CARBON DATING

Rajagopalan *

Four Carbon-14 dates obtained from Tuljapur Garhi by the Birbal Sahni Institute of Palaeobotany (BSIP), Lucknow are as follows:-

1. Sample No. and depth by submitter : No. 1 35 to 56 CM

   B.S.I.P. No. BS-606

   Date of processing : 9/7/85

   Material : Charcoal

   Pre-treatment :Treated with 1% HCL, 1·5% NAOH, 1% HCL Respectively An Hour each At 95°C. Neutralised and dried at 95°C.

   Method of CO2 evolution : by dry combustion

   Age of the Sample Based on the value of Half Life (5570 ± 30) yrs 2870 ± 100 Y.BP

   Remarks NIL

2. Sample No. and depth by Submitter: No. 2 20 CM

   B.S.I.P. No. BS-607

   Date of processing: 18/6/85

   Material: Charcoal

   Pre-treatment :

   Treated with 1% HCL, 1·5% NAOH, 1% HCL respectively an Hour each at 95° C. Neutralised and dried at 95° C.

   Method of CO2 evolution: by dry combustion

   Age of the sample based on the value of

---

* Bibal Sahni Institute of Palaeobotany, Lucknow

Half Life (5570±30) Yrs — 340 ± 90 Y.BP

Remarks — Nil

3. Sample no. and depth by Submitter: No. 3 — 5 To 20 CM

B.S.I.P. No. — BS-608

Date of processing: — 27/6/85

Material: — Charcoal

Pre-treatment : Treated with 1% HCL, respectively an hour each at 95° C. Neutralised dried at 95° C.

Method of CO 2 evolution: — by dry combustion

Age of the Sample Based on the value of

Half Life (5570±30) Yrs — 3310±90 Y.BP

Remarks — Nil

4. Sample No. and depth by Submitter : No. 4 15 to 25 CM

B.S.I.P. No. — BS-609

Date of processing : — 2/7/85

Material : — Charcoal

Pretreatment

Treated with 1% HCL, 1·5% NAOH, 1% HCL respectively an hour each at 95° C. Neutralised and dried at 95° C.

Method of CO 2 evolution : — By dry combustion

Age of the Sample Based on the Value of Half Life (5570 ±30) Yrs — 2410 ± 100 Y.BP

Remarks — Nil

SELECT BIBLIOGRAPHY

1. P.G. Adyalkar, "Palaeogeography, nature, and pattern of sedimentation and ground water potentiality of the purna Basin of Maharashtra", *Proceedings of the National Institute of Sciences of India*, Vol. 29, A, No. 1. (1963)

2. S.B. Deo & Z.D. Ansari, *Chalcolithic Chandoli* , (Poona 1965)

3. S.B. Deo & G.G. Mazumdar, *Songaon Excavations, 1965* (Poona, 1969)

4. S.B., Deo, *Excavations at Takalghat and Khapa, (1966-69)* (Nagpur, 1970).

5. M.K. Dhavalikar,"Early Farming Cultures of Central India", *Essays in Indian Protohistory*, (ed.) D.P. Agrawal and D.K. Chakrabarti (1979), pp. 229-245.

6. M.K. Dhavalikar "Early Farming Cultures of Deccan". *Essays in Indian Protohistory*, (ed.) D.P. Agrawal and D.K. Chakrabarti (1979)

7. M.K. Dhavalikar,"Daimabad - a Rediscovery" *Puratattava*, no. 3, 1969-70, pp. 34-43.

8. M.K. Dhavalikar & G.L. Possehl, "Subsistance Pattern of an Early Farming Community of Western India", *Puratattava*, no. 7 (1974), pp. 39-46.

9. M.G. Dikshit, *Excavations at Kaundinyapura*, (Bombay, 1968).

10. *Indian Archaeology - A Review*, Archaeological Survey of India, New Delhi.

11. R.V. Joshi & B.P. Bopardikar, "Drainage pattern in the Purna basin, Amraoti, Buldana districts, Maharashtra", *Indian Science Congress*, 51st and 52nd Session, Part III (1965).

12. M.S. Nagaraja Rao, *Protohistoric Cultures of the Tungabhadra Valley* (A Report on Hallur Excavations) (Dharwar, 1971).

13. S.A. Sali, *Daimabad, 1976-79*, Memoir Archaeological Survey of India, no. 83, (New Delhi 1986)

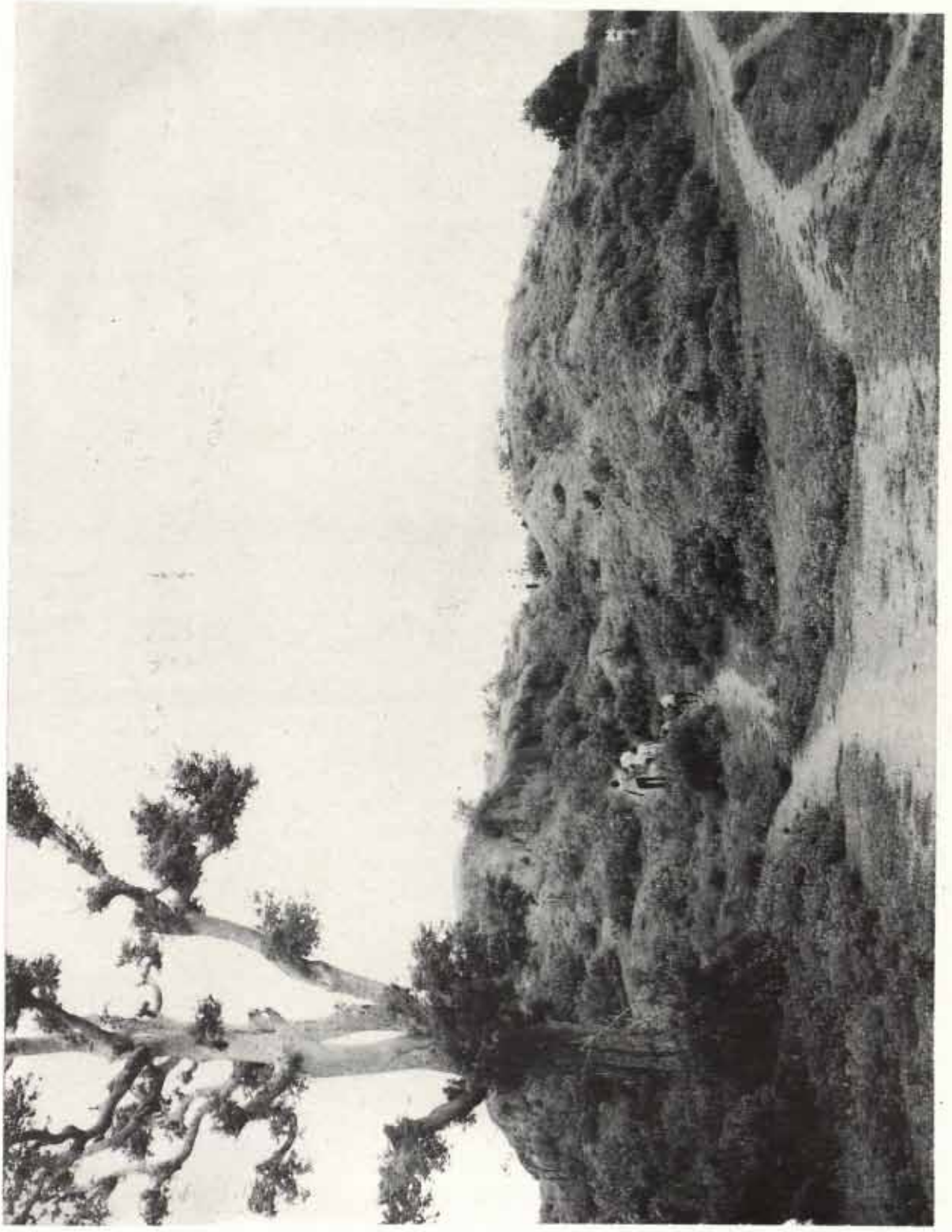
14. H.D. Sankalia & S.B. Deo, *Report on the Excavation at Nasik and Jorwe* , (1955)

15. H.D. Sankalia, B. Subbarao & S.B. Deo, *The Excavations at Maheshwar and Navdatoli*, 1952-53, (Poona, 1958)

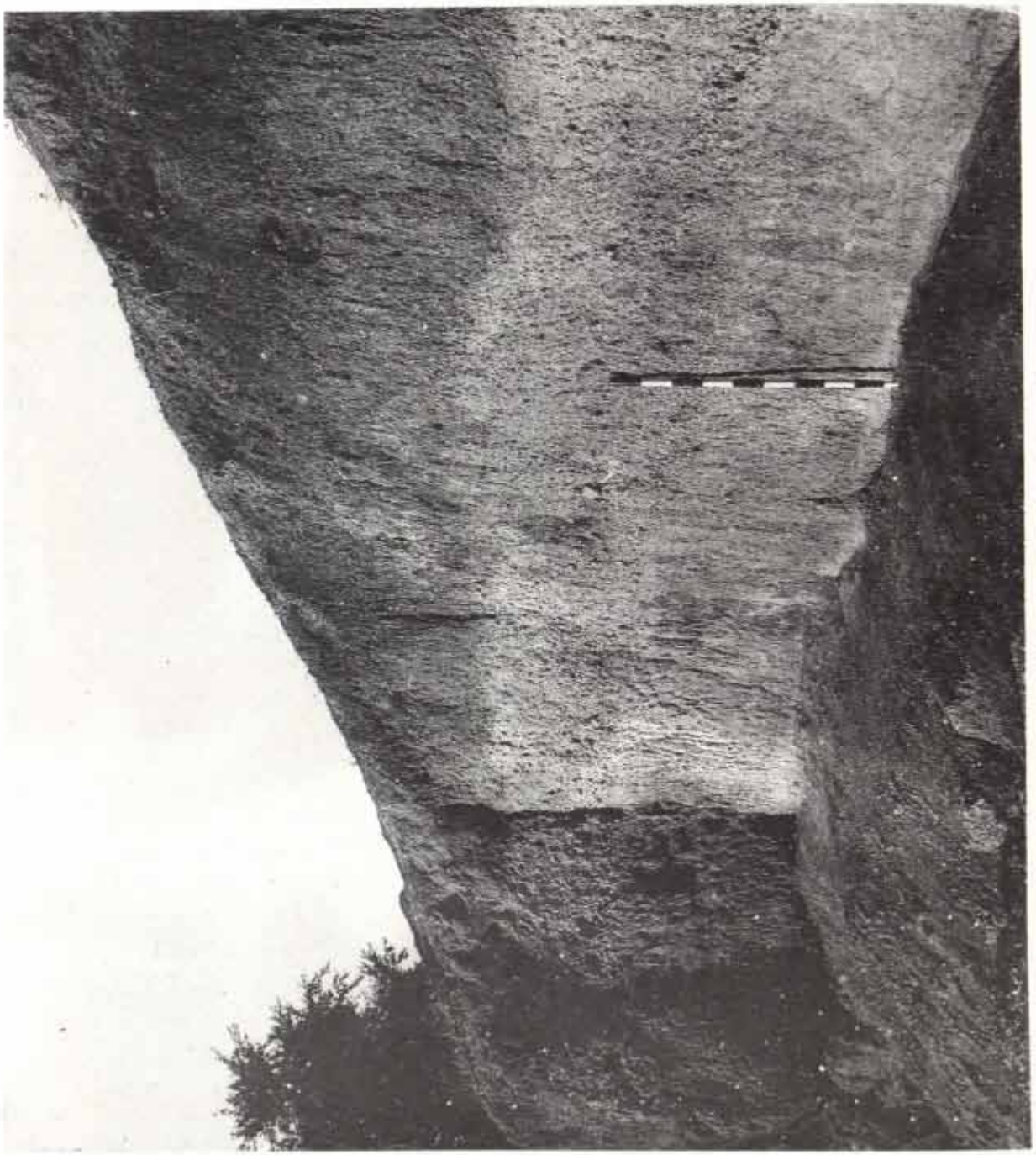
16. H.D. Sankalia, S.B. Deo, Z.D. Ansari & S. Ehrhardt., *From History to Prehistory at Nevasa* (1954-64), (Poona, 1960)

17. B. Subbarao, "Chalcolithic blade industry of Maheshwar (Central India) and a note on the history of Technique", *BDCRI*, Vol. XVII no. 1, (1955) pp. 126-149.

18. B.K. Thapar, "Prakash 1955: A Chalcolithic site in the Tapti Valley" *Ancient India*, no. 20-21 (1964 & 1965), New Delhi, 1967 pp.6-129

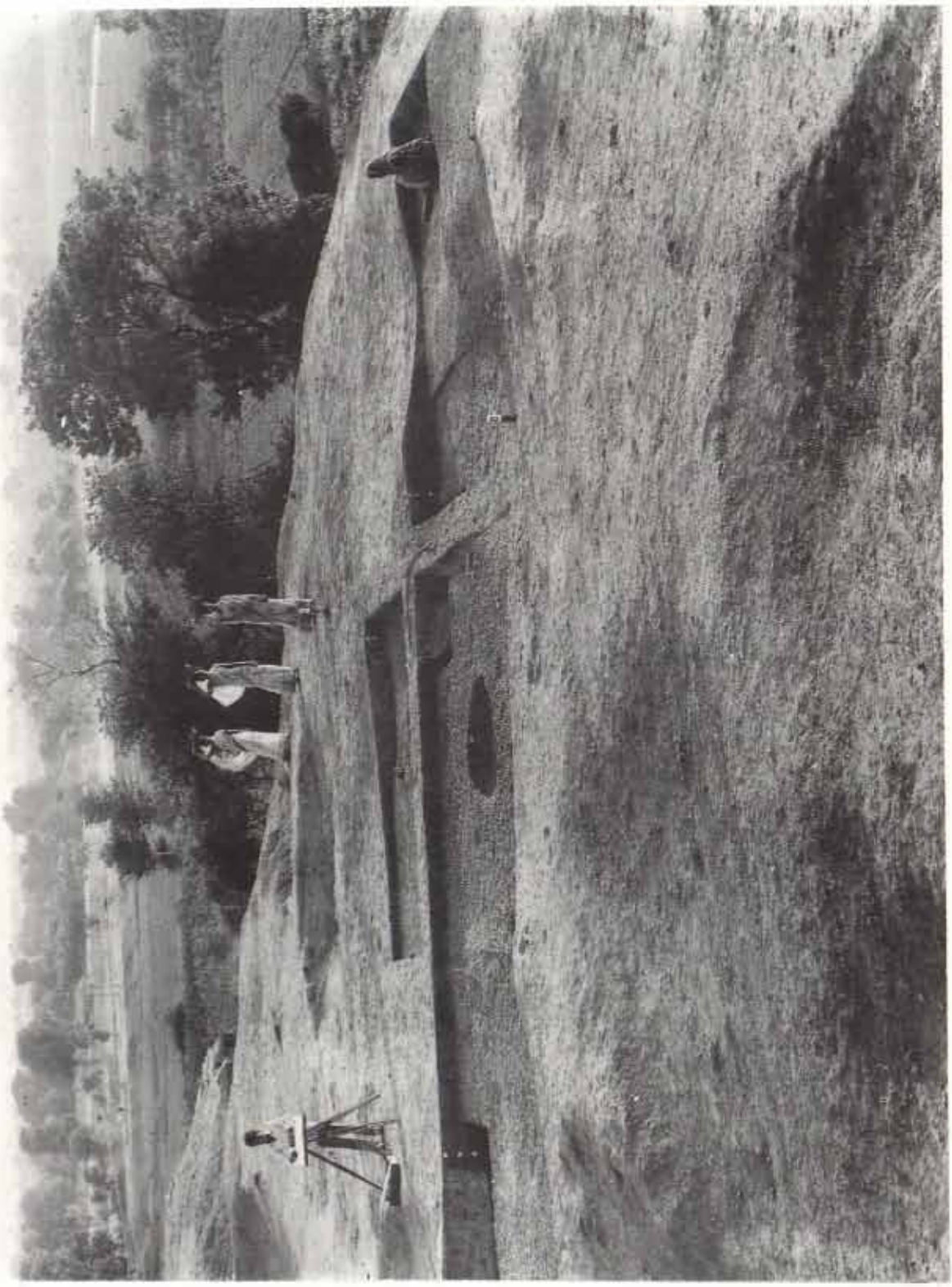


General view of the mound from south-west (river side). See p. 6

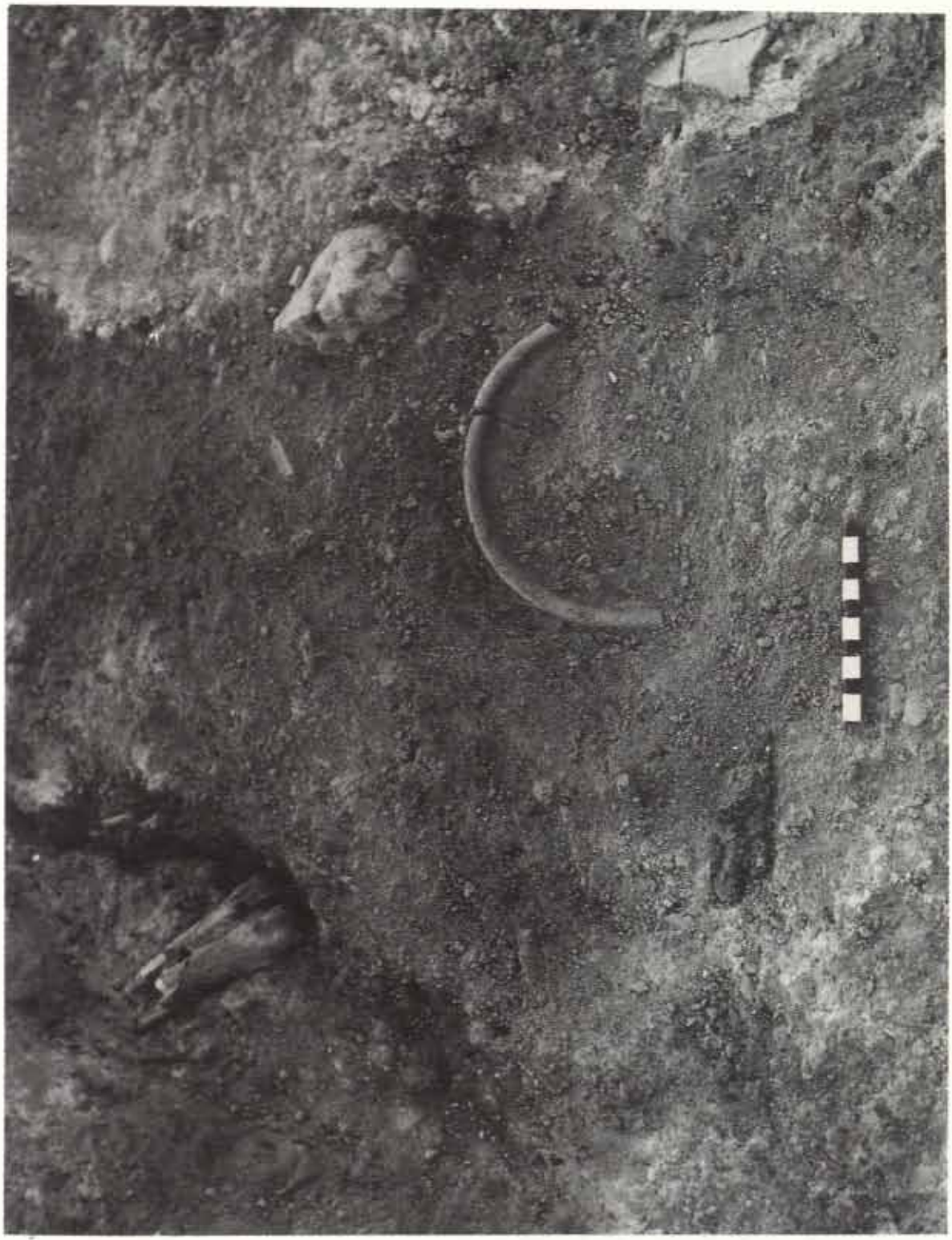


Section of the Pleistocene deposit. See p. 6

View during excavation. See p. 6

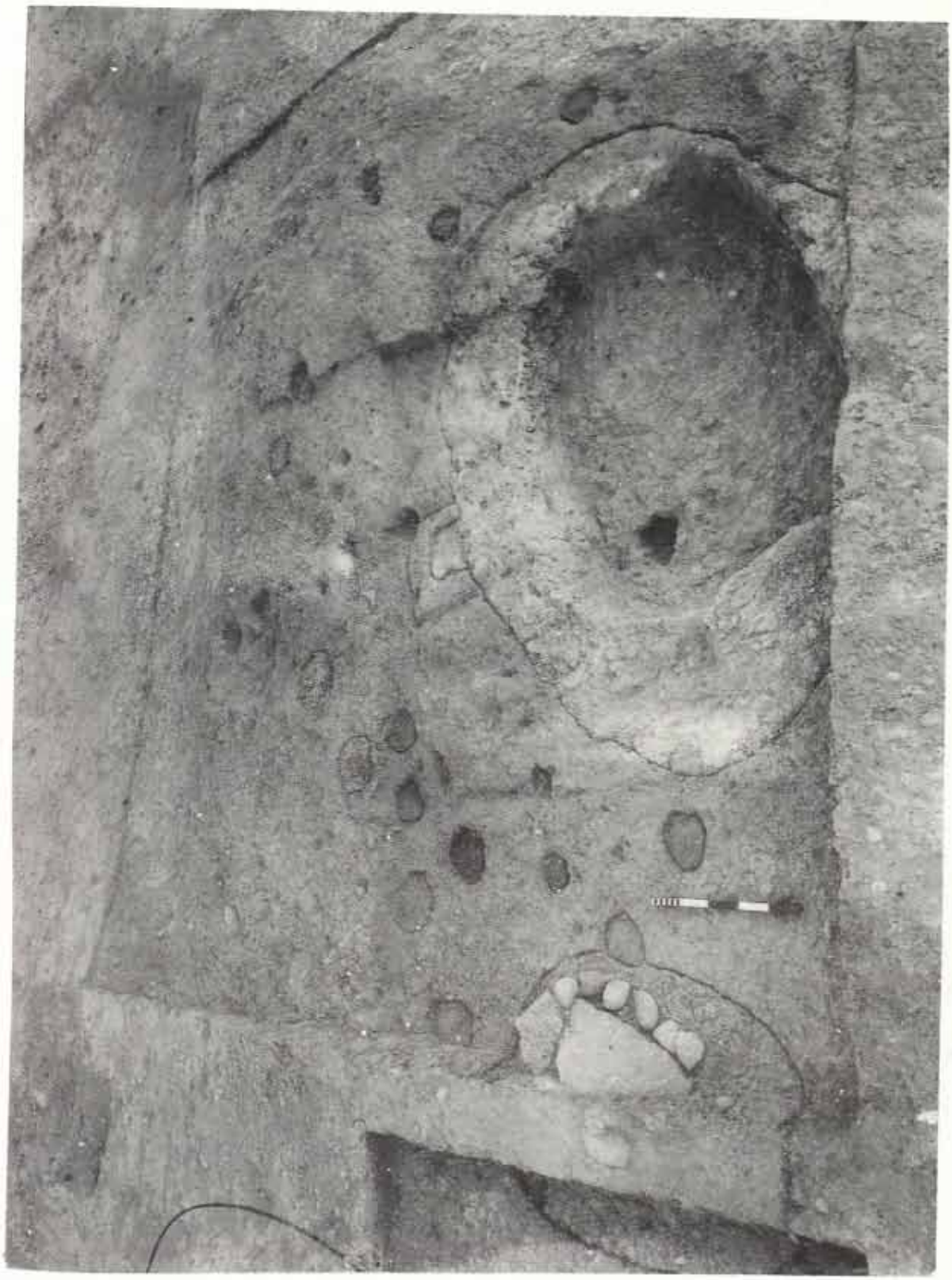


View from west showing cuttings. See p. 6

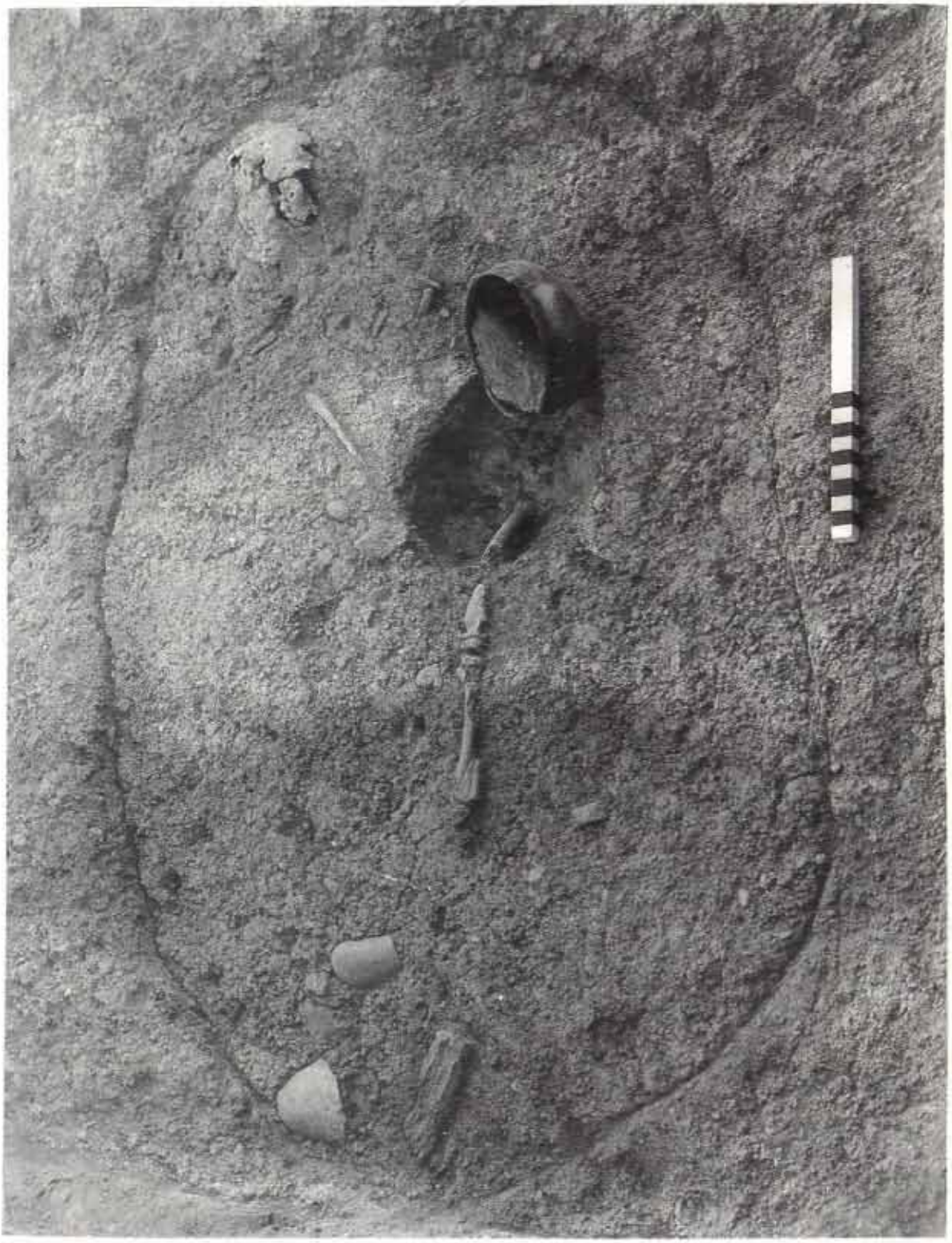


Iron arrow-head and pottery, *Tr., C1, Qd. 1. See p. 10*

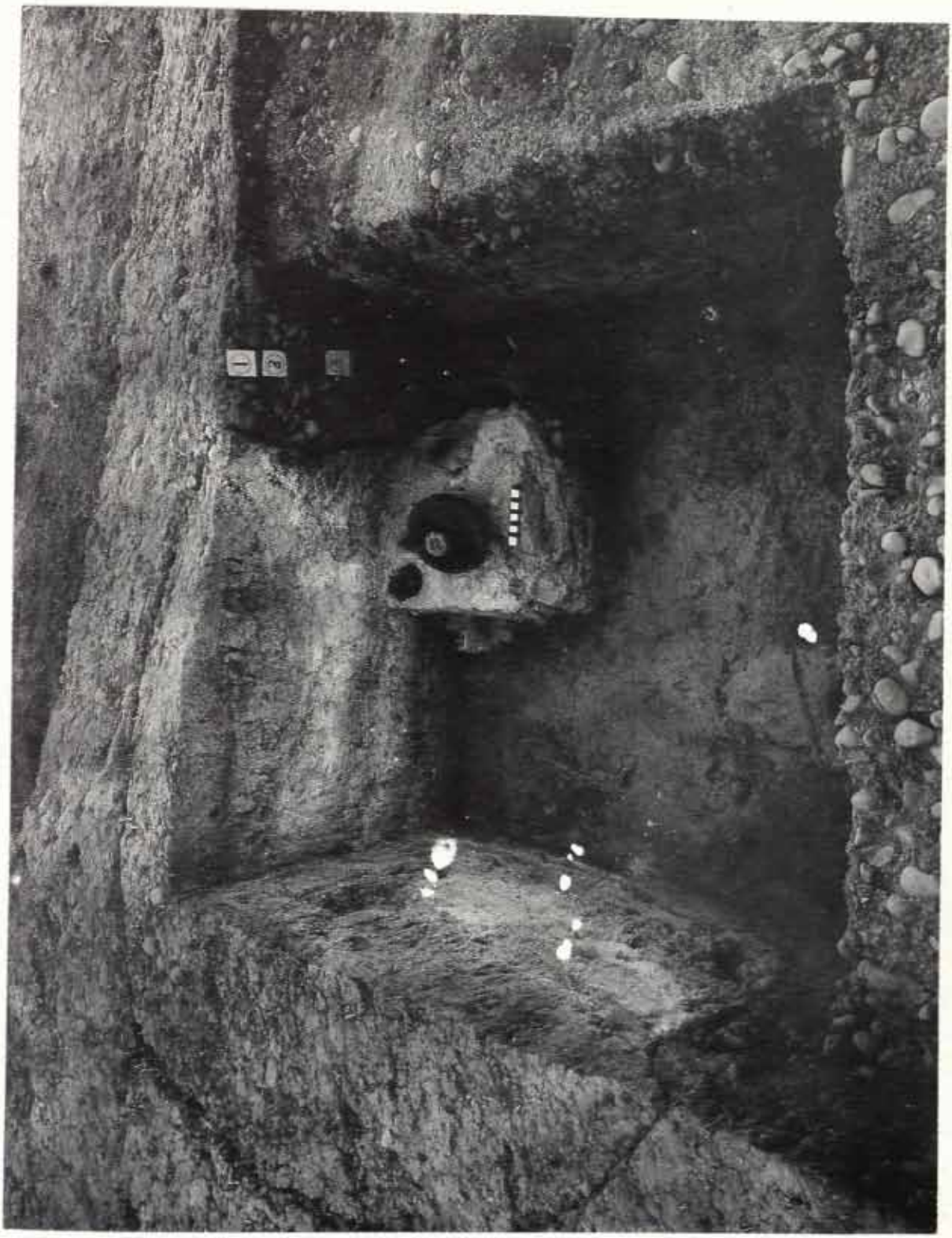
Pos-tholes, Tr., ZA4, Qd. 1. See p. 8



Kiln. Tr., C1, Qd.1. See p. 8

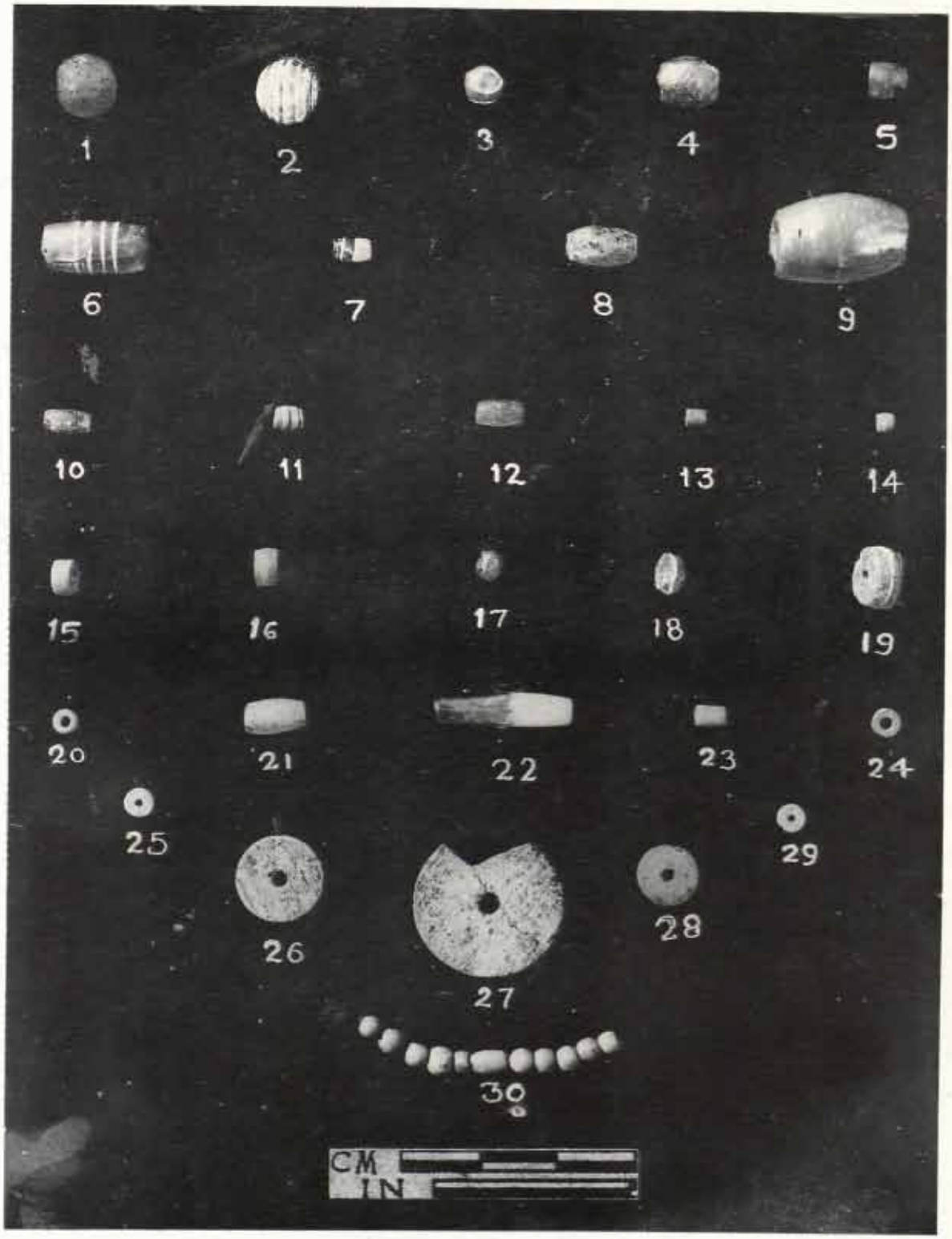


Pit burial of a child in east-west orientation. Tr., A3, Qd. 3. See pp. 10 and 43

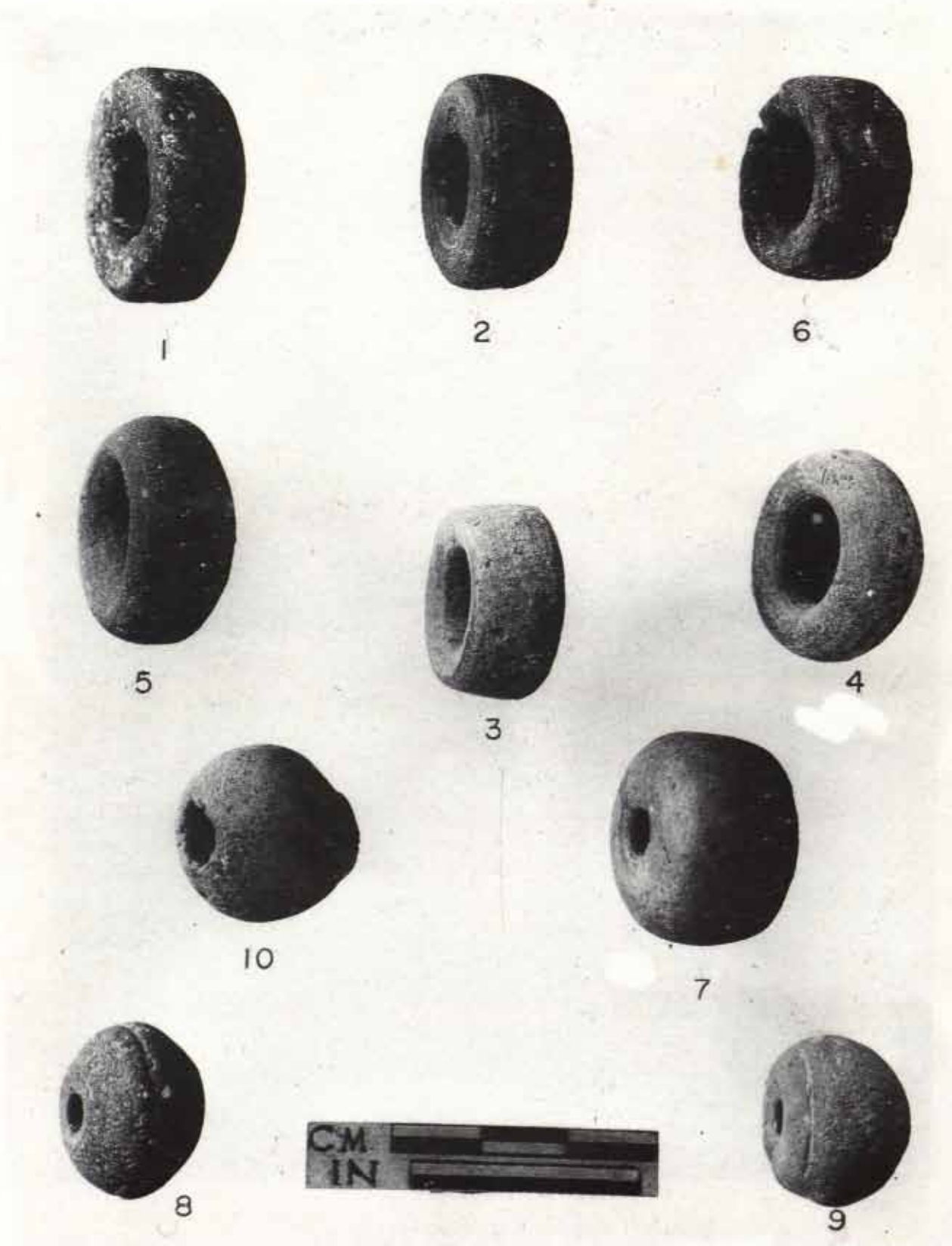


Knobbed lid of greyish black ware in a pit sealed by layer 1, Tr. XD, Qd.1. See p. 6

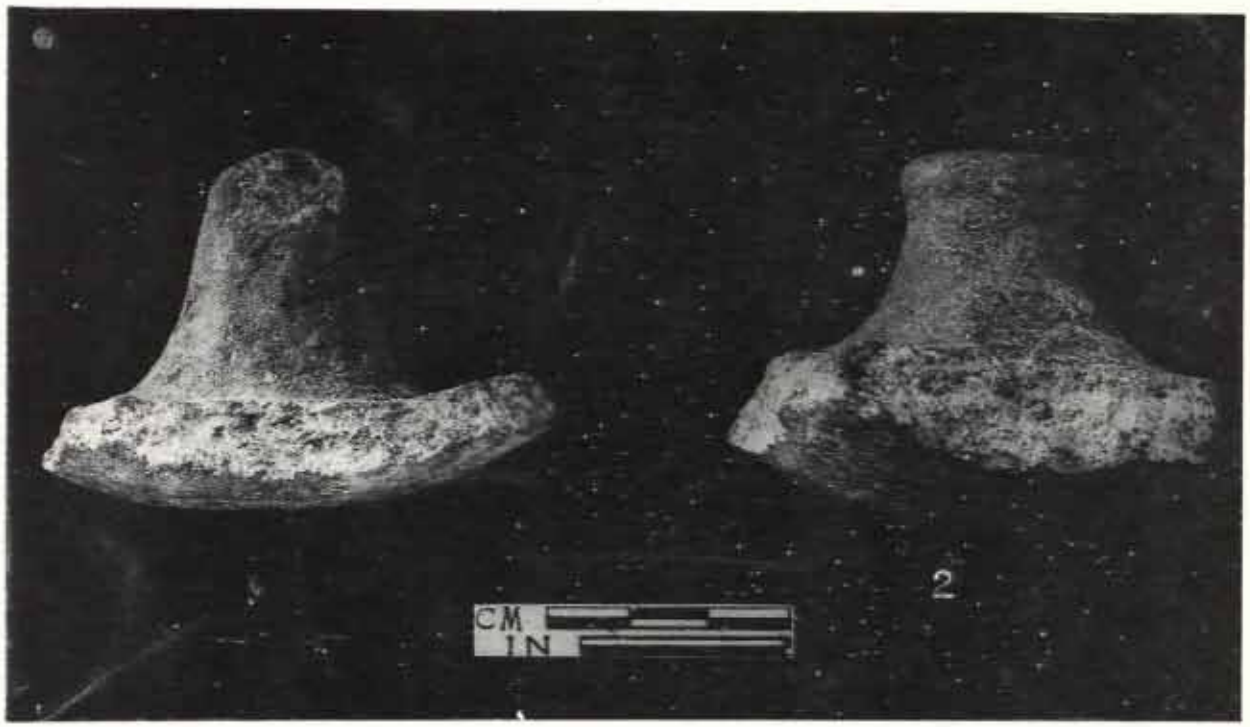
Graffiti on pottery. See pp. 12 and 24



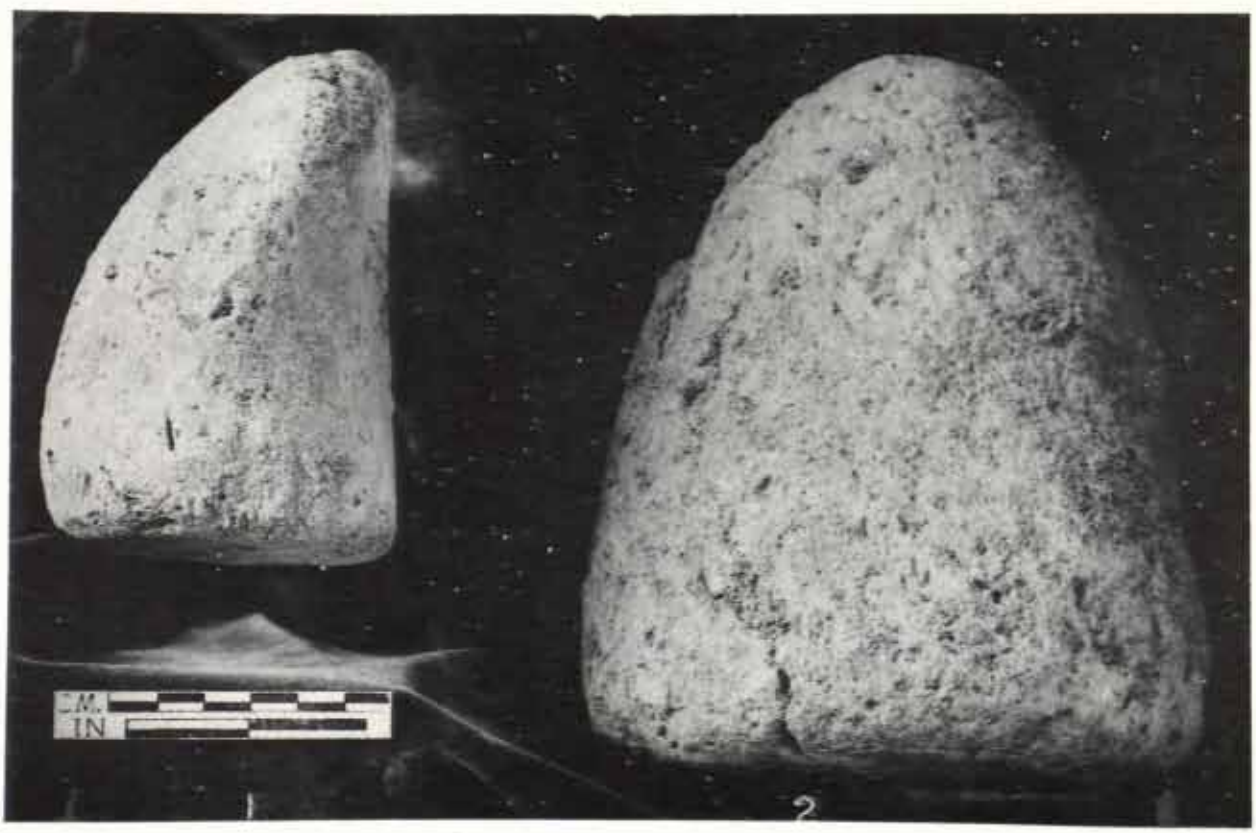
Beads of semiprecious stone and shell. See p. 34



Terracotta beads. *See p. 36*

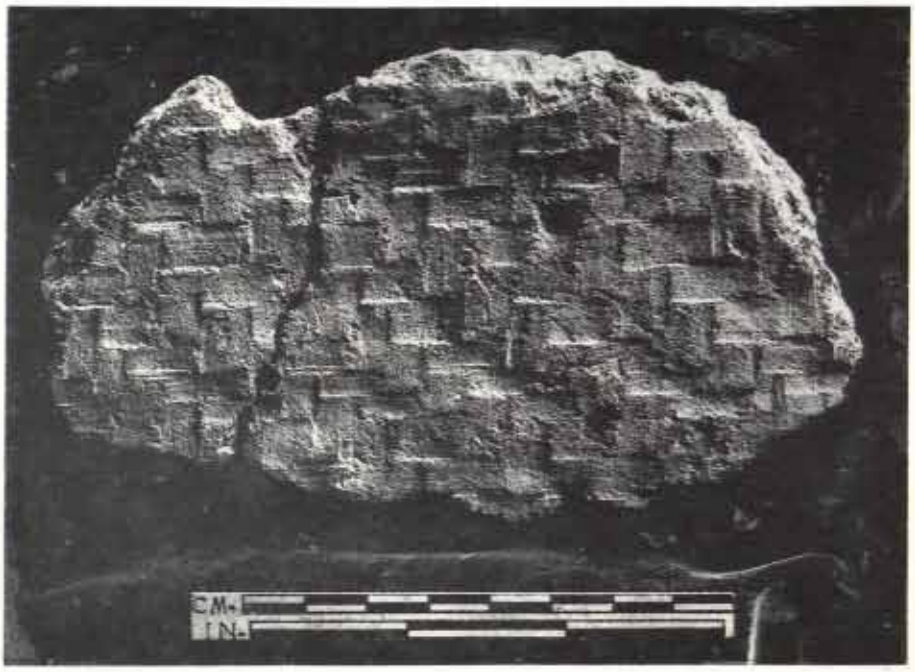


A



B

A, Terracotta dabbers; B, *cult objects. See pp. 10 and 39*

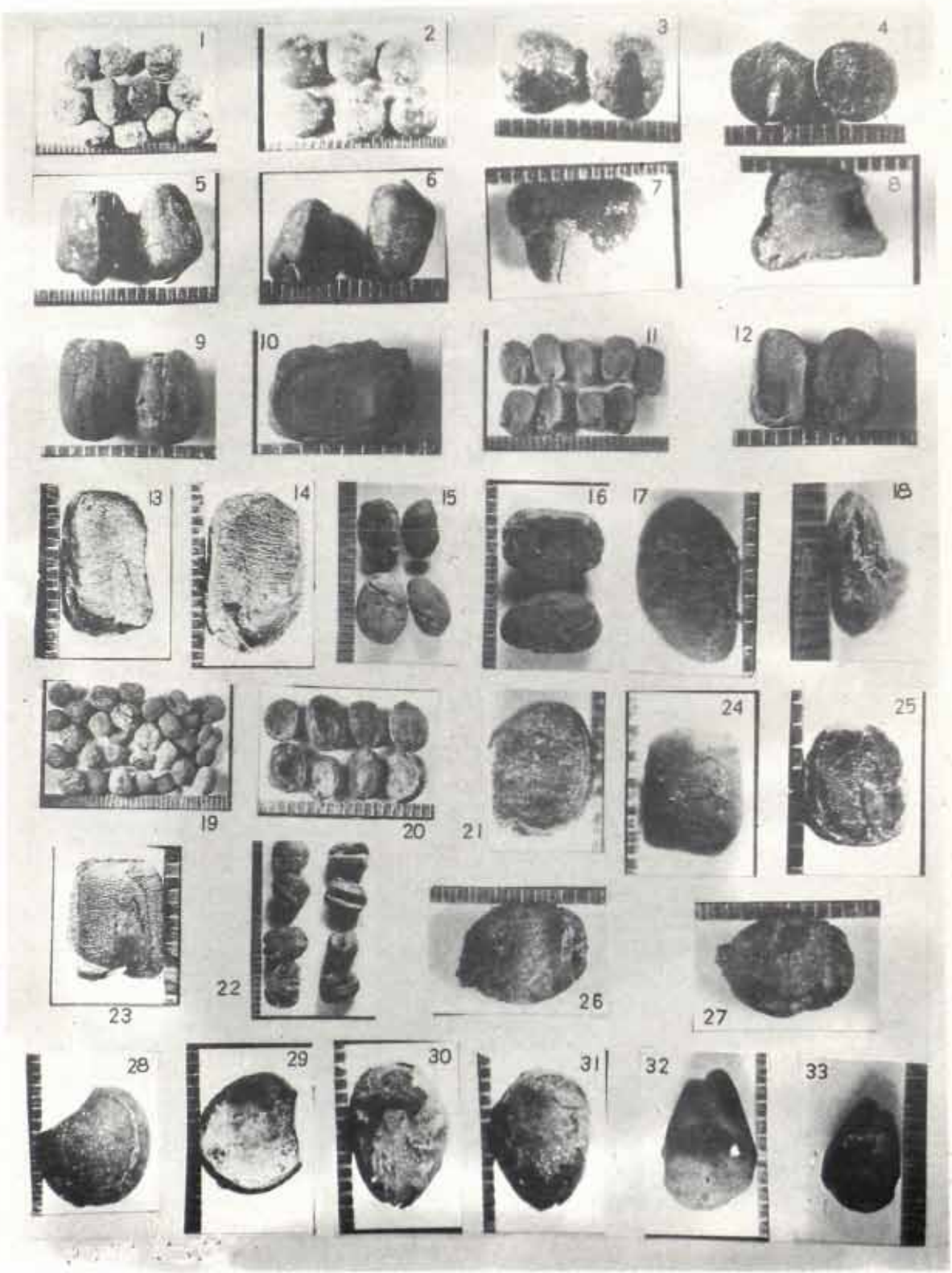


A

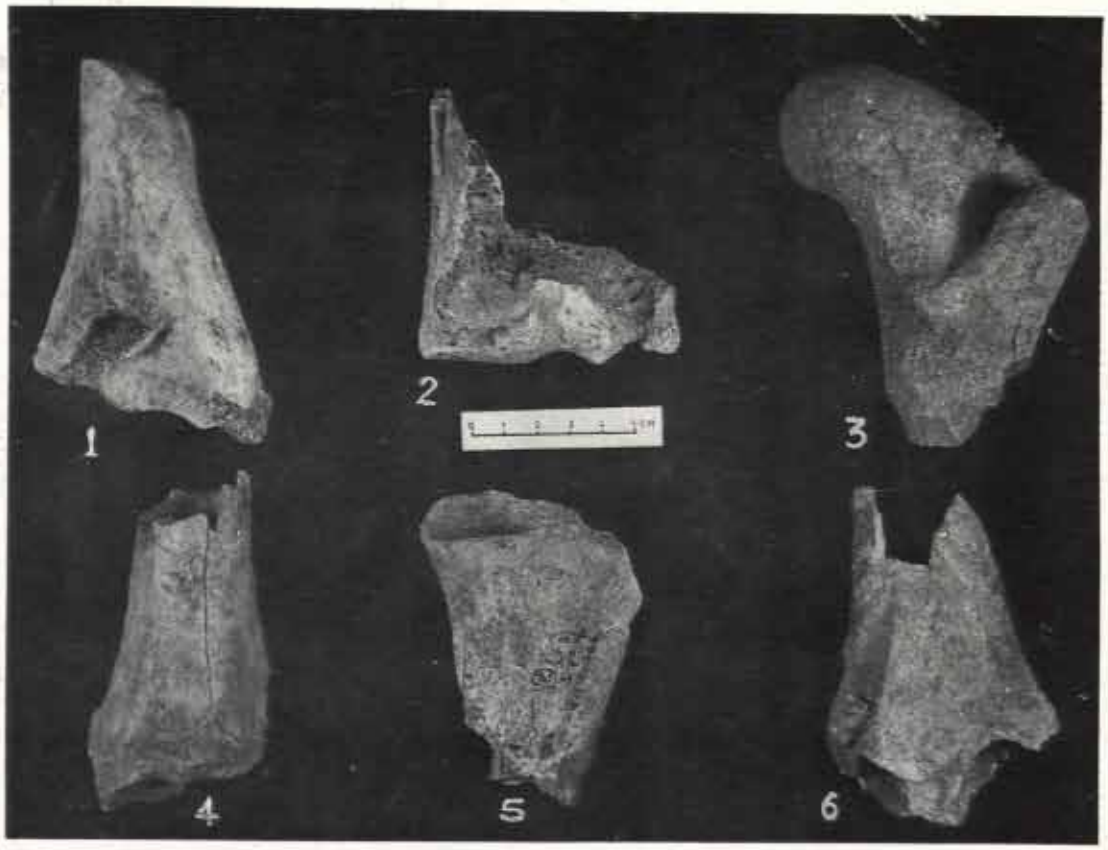
B

A, Pot-shera with mat impression; B, *bamboo impression on terracotta.* *See p. 12*

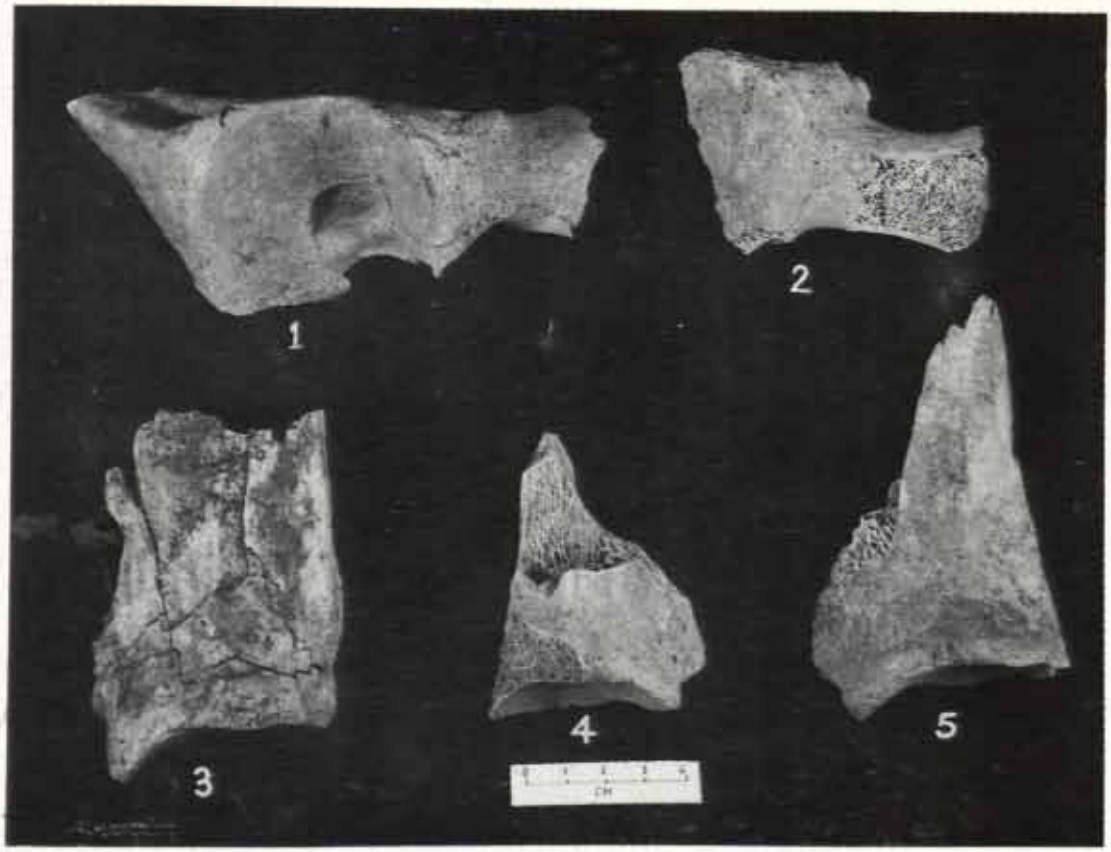
Details of plant remains. See pp. 50-54



Details of plant remains. See pp 54-56



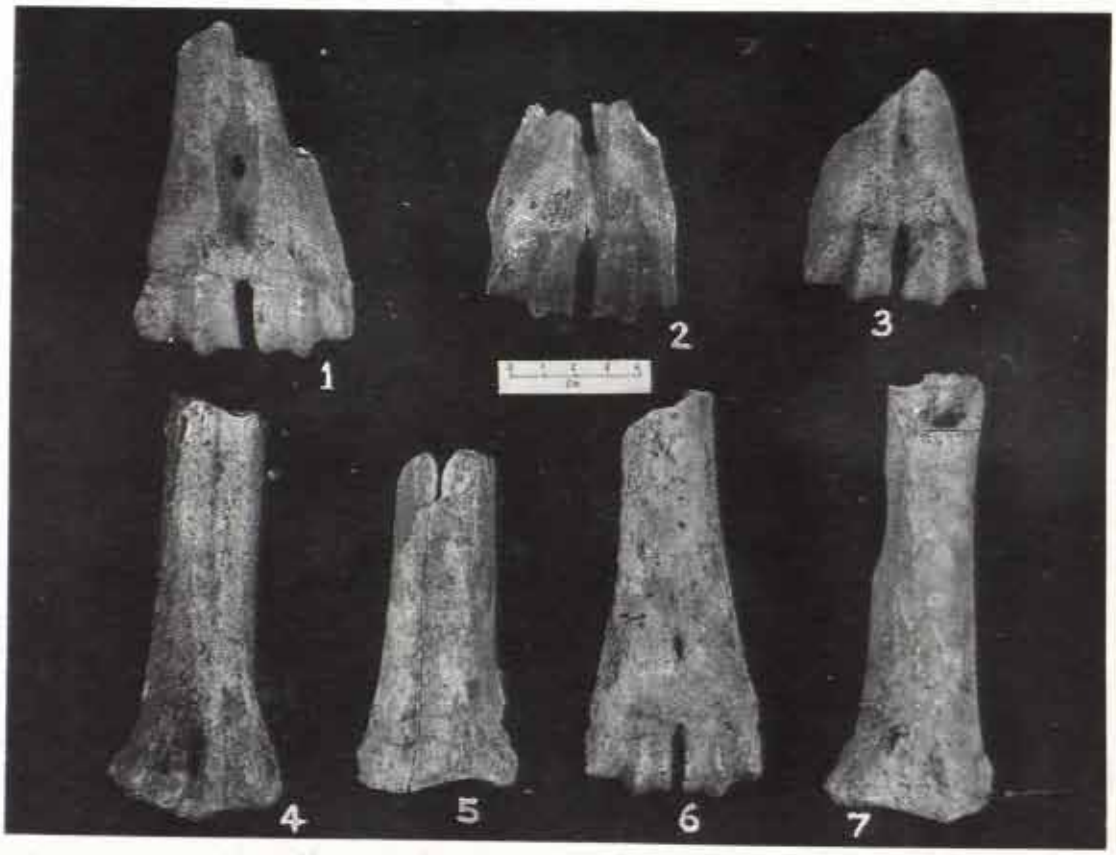
A



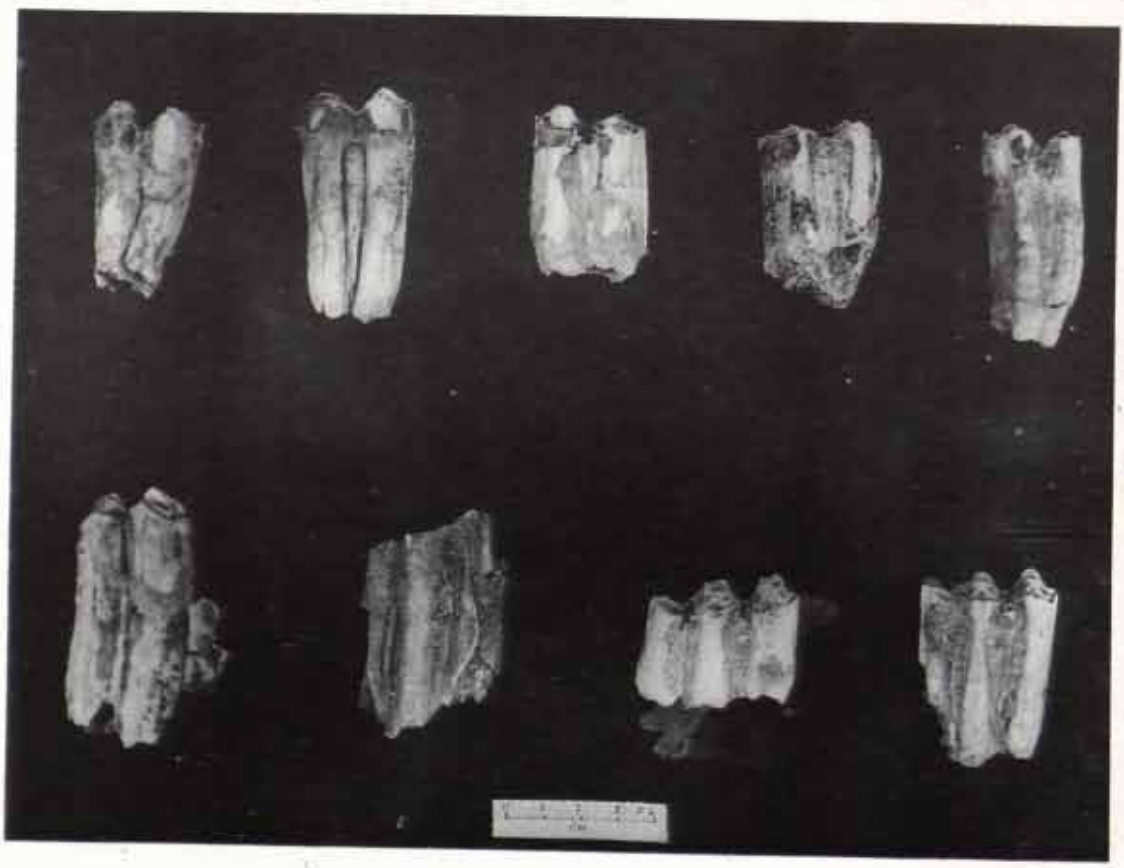
B

Animal bones. See pp. 63-64

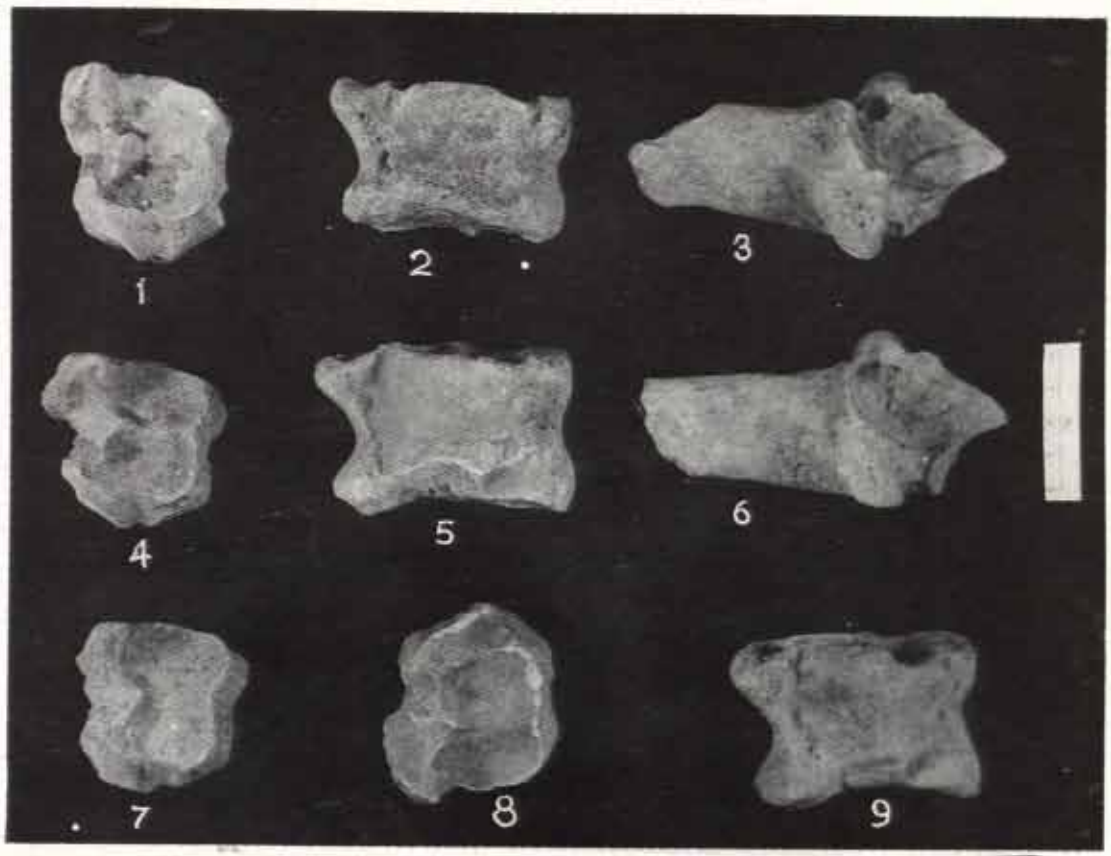
A



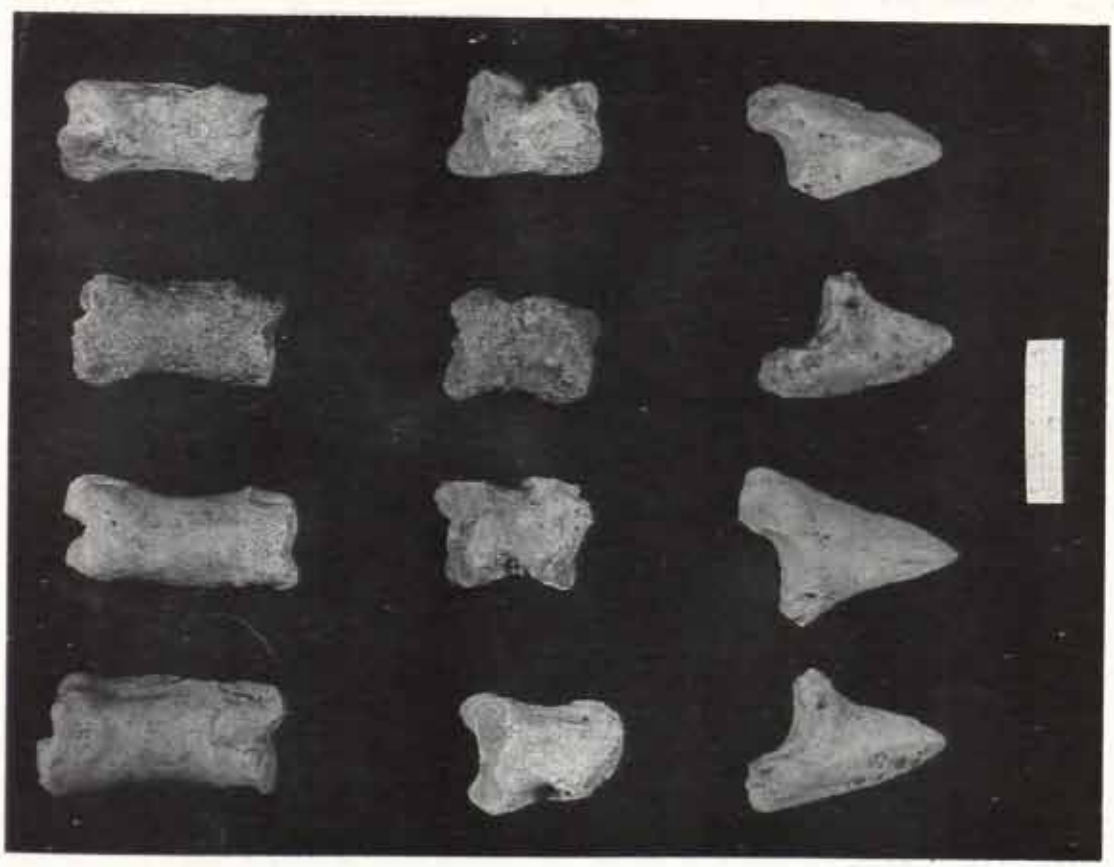
B



Animal bones. *See p. 64*

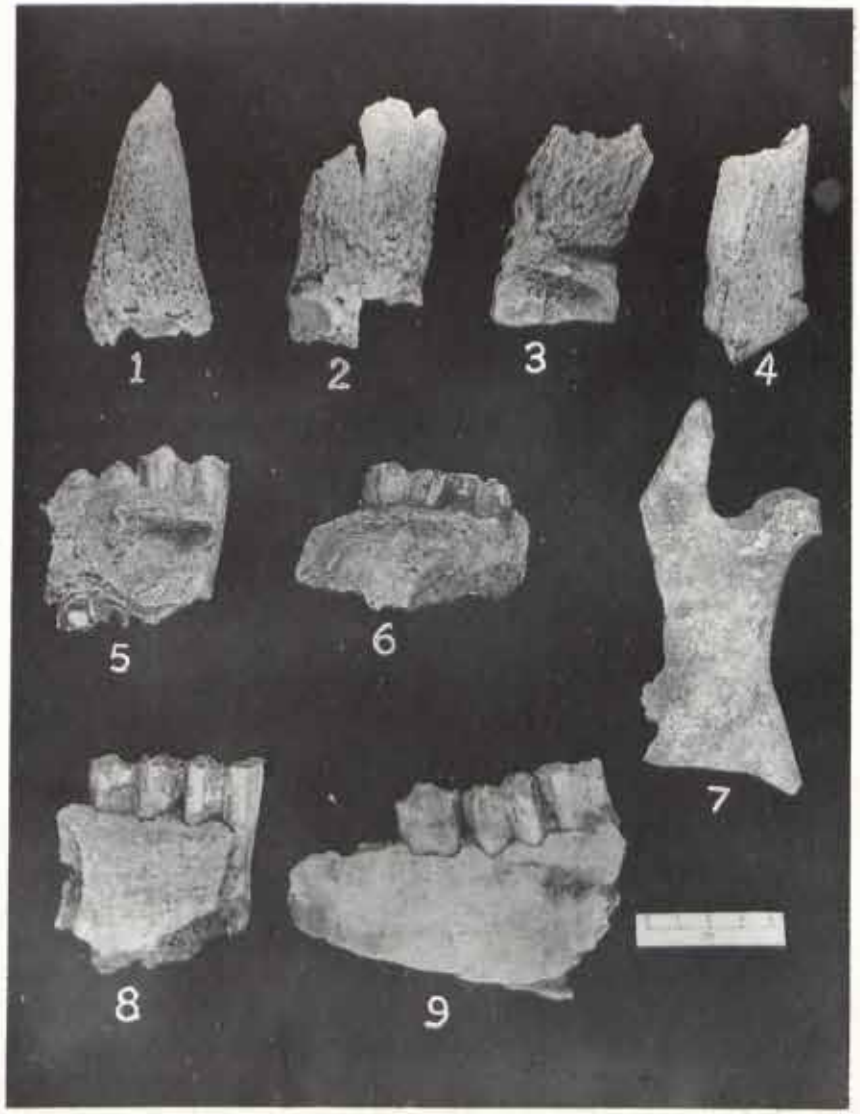


B

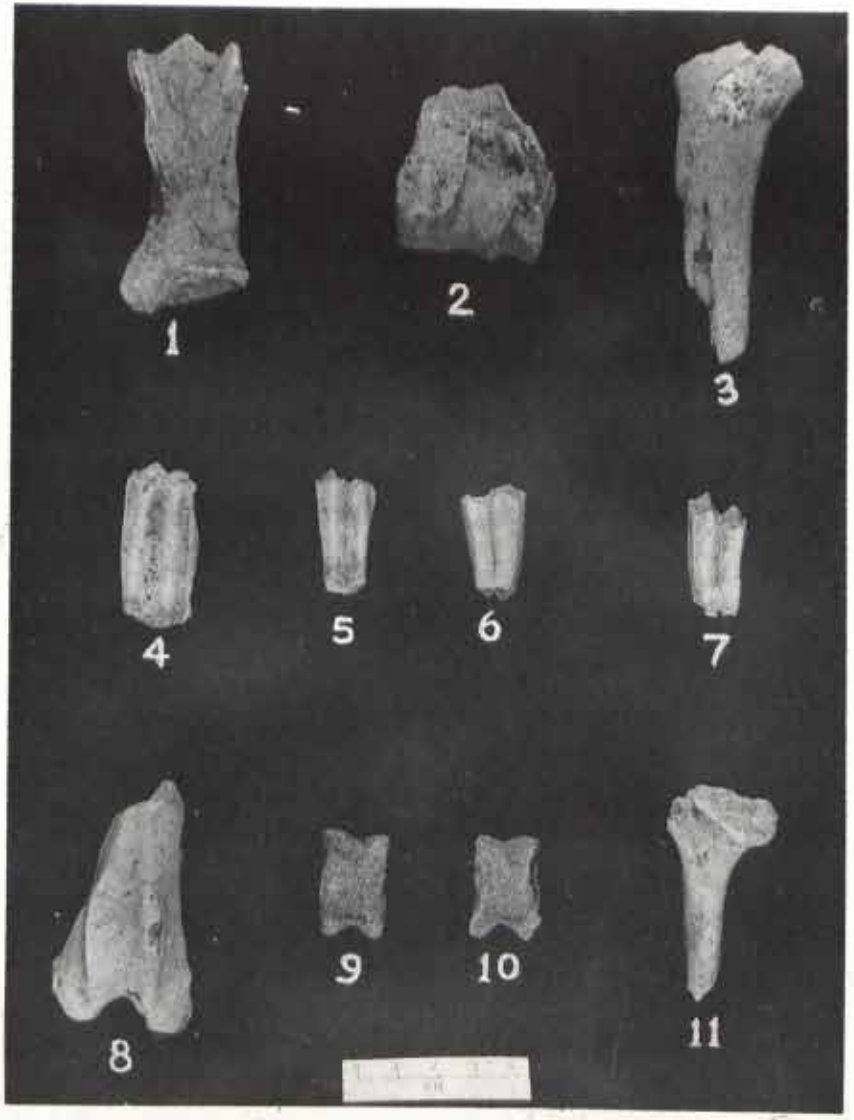


A

Animal bones. See p. 64

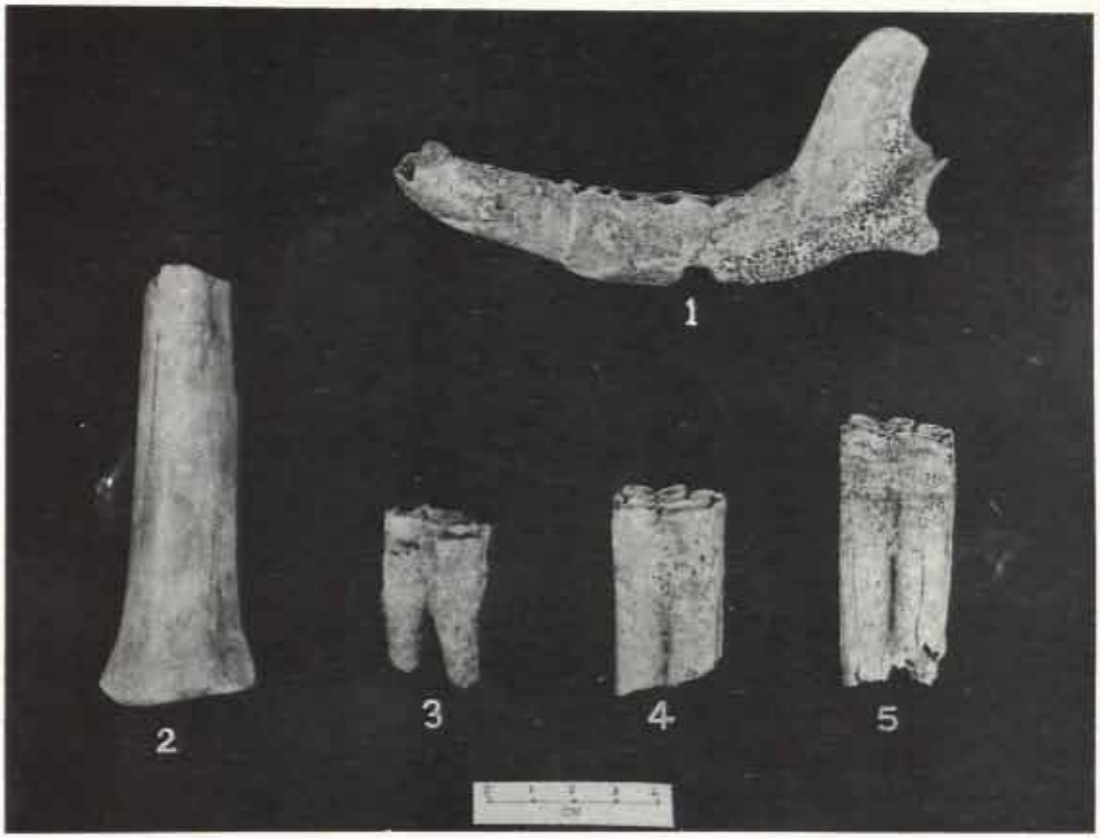


A

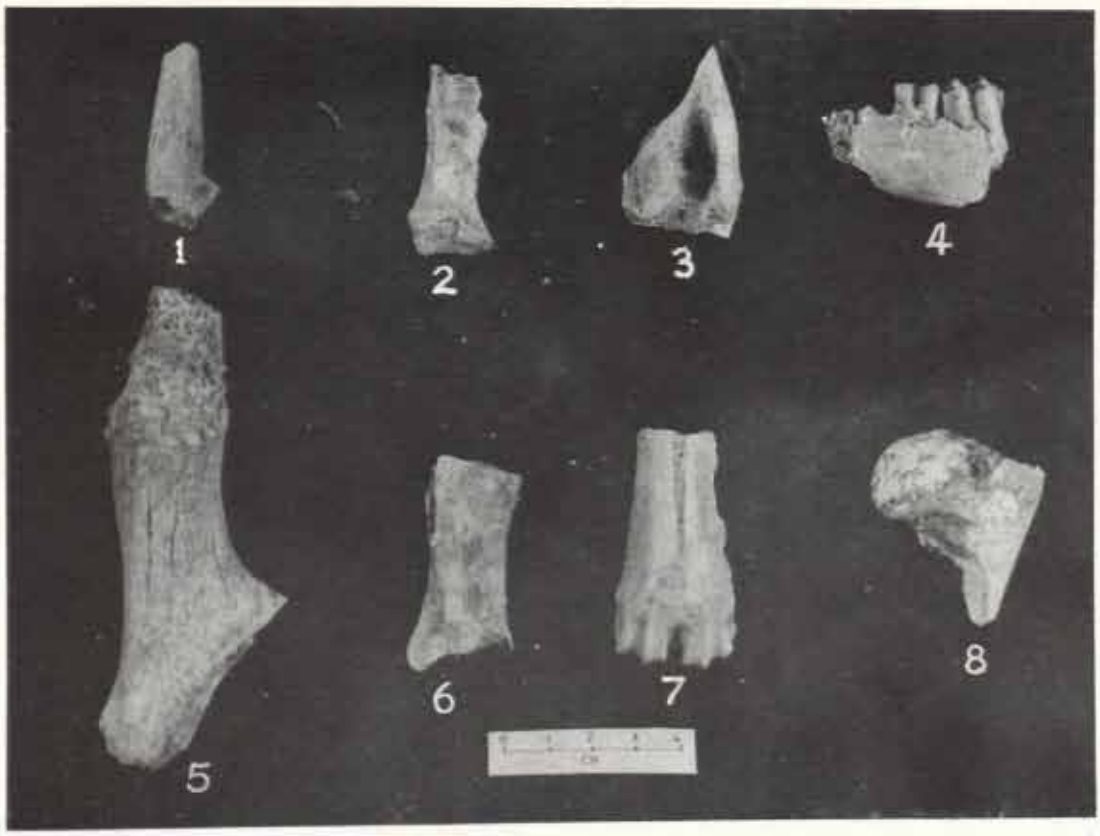


B

Animal bones. See p. 64



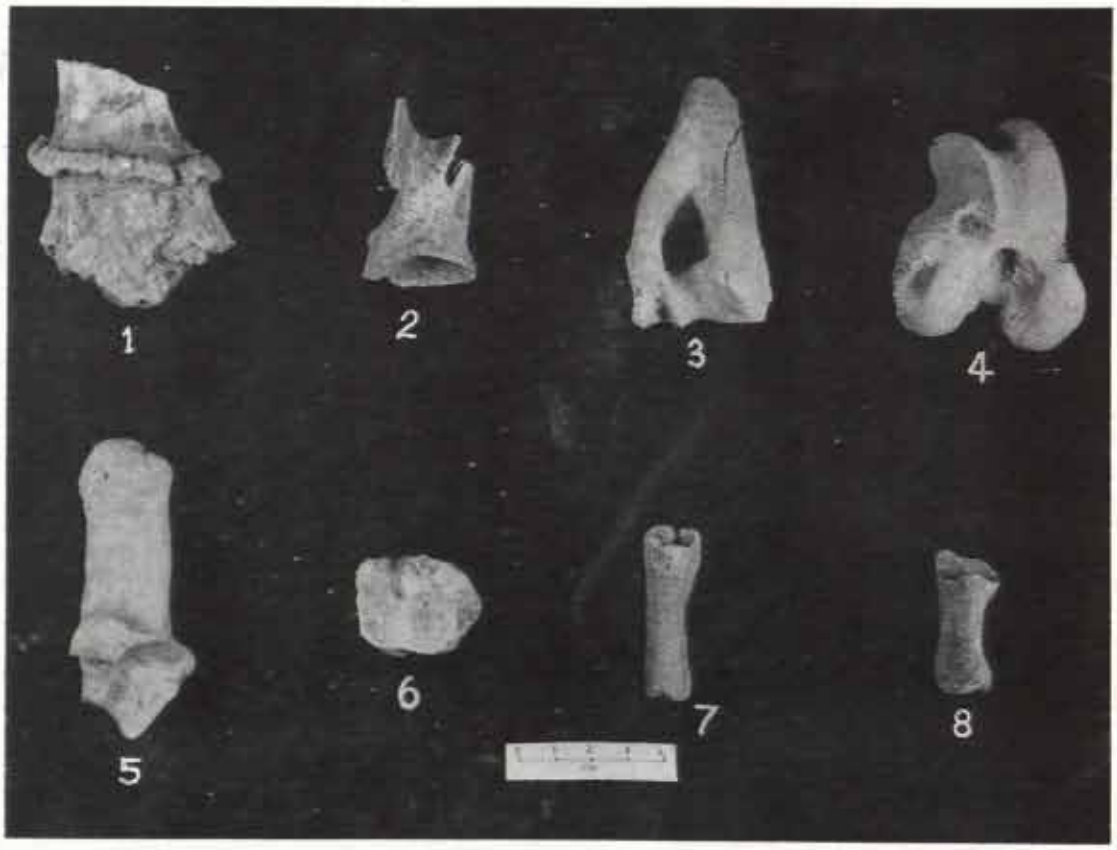
A



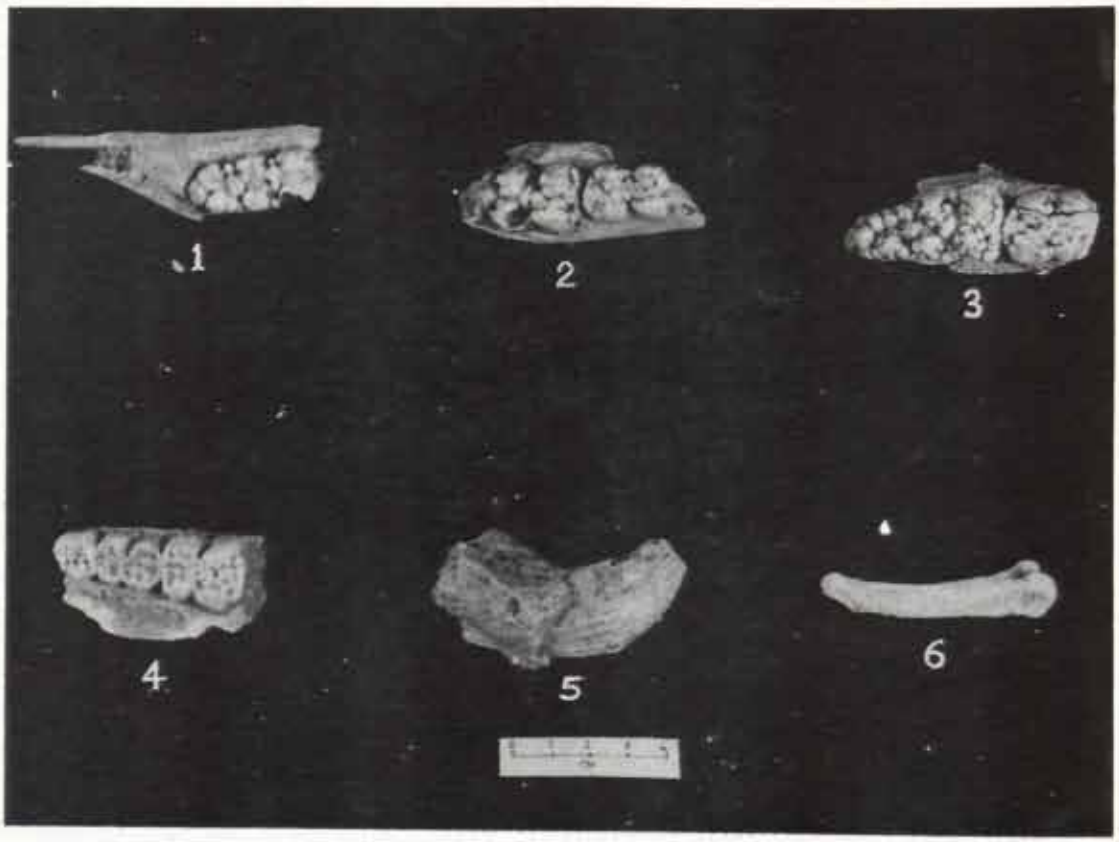
B

Animal bones. See pp. 64-65

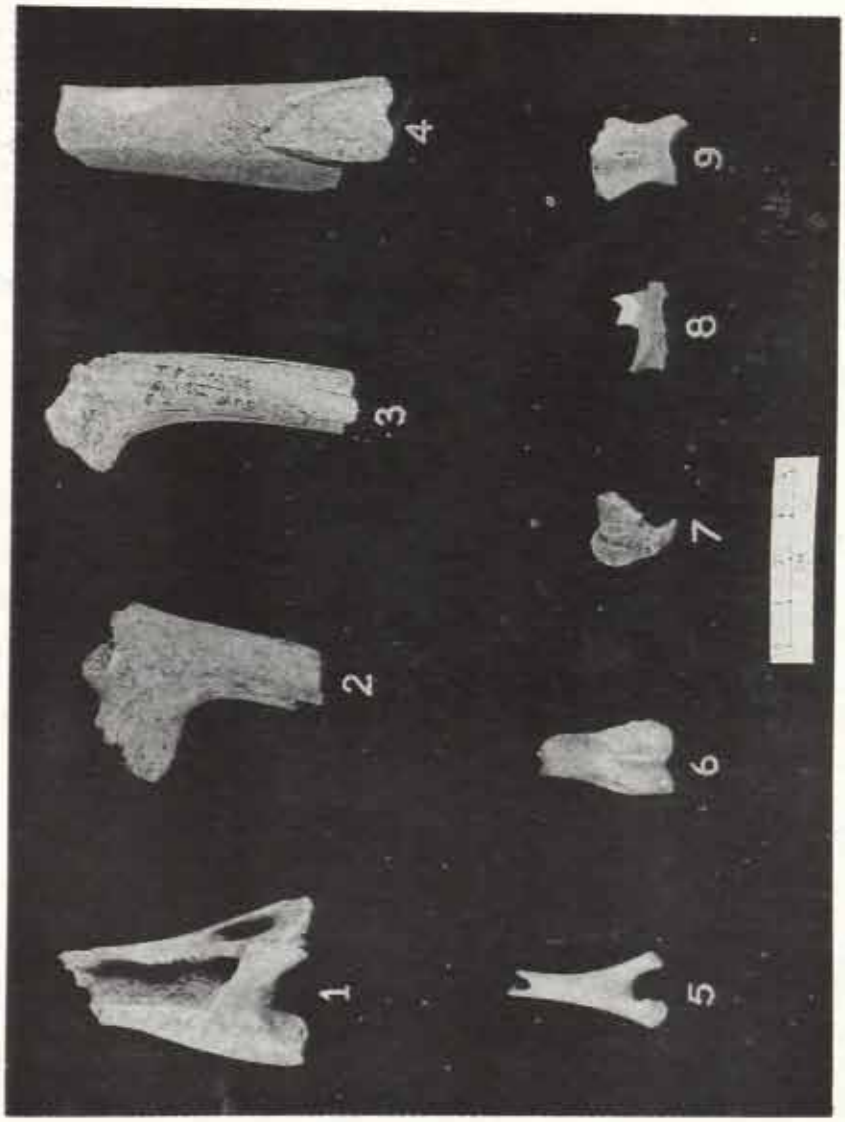
A



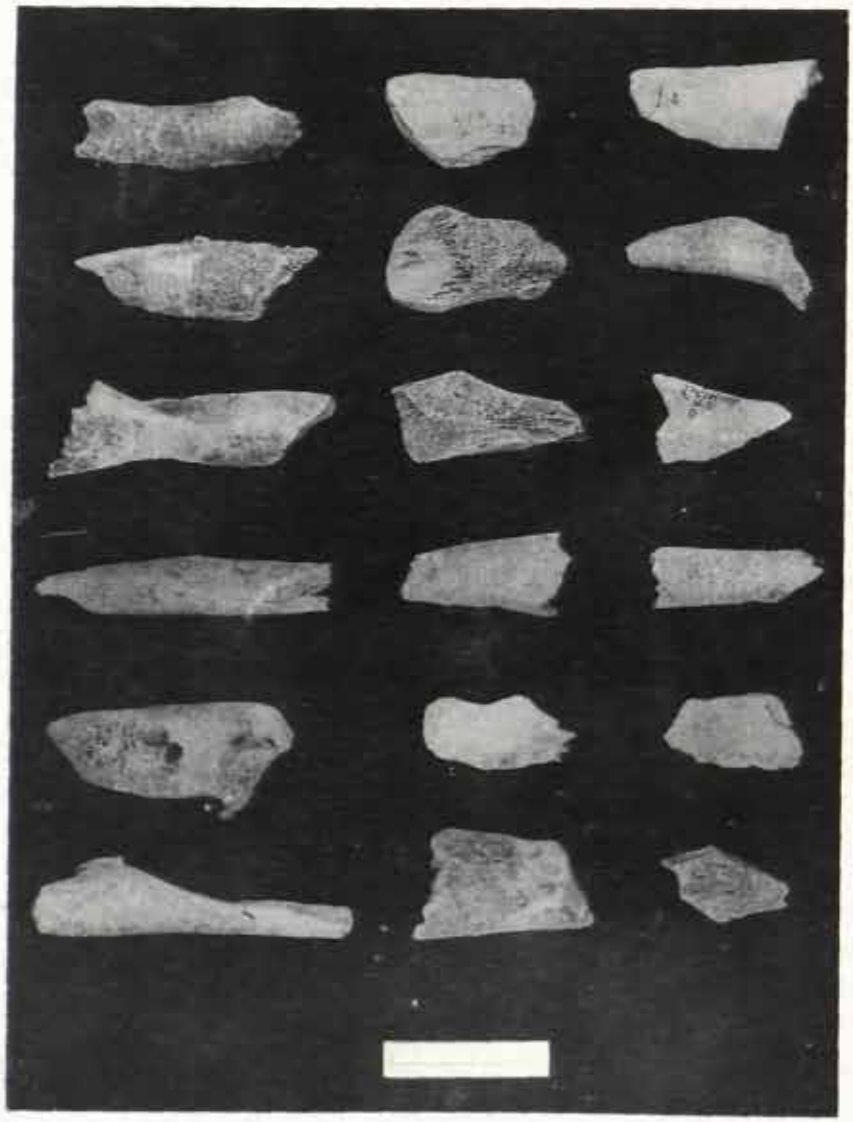
B



Animal bones. See p. 65



Animal bones. See p. 65



Bone Tools. See p. 66