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EXCAVATION AT BHAGWANPURA 1975-76

AND

OTHER EXPLORATIONS & EXCAVATIONS 1975-81 IN HARYANA, JAMMU & KASHMIR AND PUNJAB

80282

JAGAT PATI JOSHI

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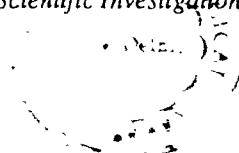
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(On Antiquarian Finds etc.)

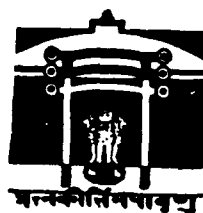
AND

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SARLA BANERJEE

(On Scientific Investigations)



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Cover:
*Bhagwanpura : Conjectural
painting showing life in successive
Sub-periods*

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CONTENTS

	Page
List of plates	v
List of coloured plates	ix
List of figures	xi
I. Introductory	
A. General Remarks	1
B. Acknowledgements	2
C. The problem and its approach	5
D. Explorations	7
II. The Setting	9
A. The Site	9
B. Discovery	9
C. Environments	9
D. Sarasvati	9
III. Summary of Results	17
IV. Chronology	23
V. Life during the period of overlap of Late Harappan and Painted Grey Ware cultures at Bhagwanpura	27
A. Architecture	27
B. Food Habits	27
C. Domestication of Animals	29
D. Religion	29
E. Arts and Crafts	29
F. Society	30
VI. Cuttings	33
VII. Structures	39
VIII. The pottery	45
IX. Other Finds	117
A. Beads	117
B. Bangles	124
C. Terracotta human figurines	126
D. Terracotta animal figurines	126
E. Terracotta dabbers	129
F. Terracotta balls	129
G. Terracotta stoppers	130
H. Terracotta skin-rubbers	130
I. Ear-ornaments	131
J. Terracotta wheels	131
K. Hopscotch discs and toy cart frame	132

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CONTENTS

				Page
L.	Terracotta indeterminate objects	133
M.	Terracotta miscellaneous objects	133
N.	Bone and ivory objects	.....	.....	133
O.	Copper objects	.....	.....	136
P.	Stone balls	.....	.....	137
Q.	Stone querns and pestles	.....	.....	137
X.	Inscribed Material	Jagat Pati Joshi	.....	139
XI.	Animal Skeletal Remains	A.K. Sharma	.....	143
XII.	Field observations on human skeletons	A.K. Sharma	.....	149
XIII.	A Morphometric Analysis of the human skeletal remains	S.C. Tiwari and Sarla Banerjee	.....	155
XIV.	Thermoluminescence Dating of Potteries Excavated at Bhagwanpura	K.S.V. Nambi, R. Sasidharan and S.D.Soman	.....	185
XV.	Scientific Investigation of Pottery	B.N. Tandon	.....	209
XVI.	Analysis of Glass from Bhagwanpura	B.N. Tandon	.....	219
XVII.	Examination of Metallic Samples	B.N. Tandon	.....	223
XVIII.	Analysis of Soil Samples from Bhagwanpura	R.V. Joshi	.....	225
XIX.	Explorations and Excavations in Haryana, Jammu & Kashmir and Punjab	Jagat Pati Joshi and Madhu Bala	.....	227
Index	.....	C. Dorje	.....	255

LIST OF PLATES

- I : General view of the mound from east, before excavation
- II : General view of the mound from west, before excavation
- III : General view of the mound from south-west, before excavation
- IV : Section looking west, Trench D1, Qd. 2
- V : Mud platform with a step, Sub-period IA
- VI : Post-holes and saddle querns in a circular hut, Sub-period IB, Phase I
- VII : Mud house, Sub-period IB, Phase II
- VIII : Cluster of burnt bricks of a disturbed structure, Sub-period IB, Phase III
- IX : Bricks of various sizes, Sub-period IB, Phase III
- X : Oval structure no. IV having two phases of construction
- XI : Cross-section of an oval structure showing burnt material, Sub-period IB, Phase II
- XII : Oval structure, Sub-period IB, Phase II
- XIII : Thick grey mat-impressed potsherds, Sub-period IB
- XIV : Painted red ware designs, Sub-period IA and IB
- XV : Painted red ware designs, Sub-period IA and IB
- XVI : Painted red ware designs, Sub-period IA and IB
- XVII : Painted red ware, Sub-period IA and IB
- XVIII : Incised red ware, Sub-period IA and IB
- XIX : Incised red ware, Sub-period IA and IB
- XX : Incised red ware, Sub-period IA and IB
- XXI : Incised red ware, Sub-period IA and IB
- XXII : Incised red ware, Sub-period IA and IB
- XXIII : Incised red ware, Sub-period IA and IB
- XXIV : Painted Grey Ware, Sub-period IB
- XXV : Beads of semiprecious stones
- XXVI : Beads of semiprecious stones
- XXVII : A, Beads of semiprecious stones and faience
B, Beads of terracotta
- XXVIII : A and B, Beads of terracotta
- XXIX : Bangles
- XXX : A, Faience bangles
B, terracotta human figurines
- XXXI : Terracotta animal figurines
- XXXII : Terracotta animal figurines
- XXXIII : A, Terracotta dabbers
B, Terracotta balls
- XXXIV : Terracotta stoppers
- XXXV : A, Terracotta skin-rubbers
B, Terracotta and bone ear-ornaments

LIST OF PLATES

- XXXVI : Terracotta wheels
- XXXVII : Terracotta hopscotch and toycart frame
- XXXVIII : A and B, Terracotta miscellaneous objects
- XXXIX : Bone and ivory objects
 - XL : Copper objects
 - XLI : Stone balls
 - XLII : Stone querns and pestles
 - XLIII : A, terracotta inscribed objects
B, terracotta inscribed object
 - XLIV : A, Graffiti on pottery
B, Graffiti on pottery
 - XLV : Graffiti on pottery
 - XLVI : Graffiti on pot
 - XLVII : A, Bones of cattle
B, Bones of cattle 1 and 3 of massive variety
- XLVIII : A, Phalanges of cattle of different sizes
B, bones of cattle, sheep and goat
- XLIX : Bones of sheep and goat
 - L : A, Bones of sheep and goat
B, Bones of sheep and goat
 - LI : A, 1, 3, 5, bone of horse ; 2, 4, 6, bone of ass
B, Bone-tools
 - LII : A, Burial no. 1, female child
B, Burial no. 2, male (adult)
 - LIII : A, cranium norma lateralis
B, cranium norma verticalis
 - LIV : A, norma lateralis, broken styloid processes
B, norma basalis
 - LV : A, lower jaw, lateral view
B, lower jaw, upper view
 - LVI : A, vertebrae
B, humerus (right)
 - LVII : A, radius (right)
B, ulna (left)
 - LVIII : A, femur (left)
B, tibia (right)
 - LIX : A, fibula (right and left)
B, cranium norma lateralis, Burial II

LIST OF PLATES

- LX : A, cranium norma lateralis, Burial II
B, humerus (right and left)
- LXI : A, radius (right and left).
B, femur (right and left)
- LXII : A, Pottery: red ware, external appearance with marks
B, Pottery: red ware, external appearance with marks
- LXIII : Pottery: grey ware and black ware, external appearance with marks
- LXIV : A, Scanning electron micrograph: pottery sample no. 12, magnification 1.1K, needle shape elongated crystal
B, Scanning electron micrograph: pottery sample no. 12, magnification 2.2K, needle shape elongated crystal
C, Scanning electron micrograph: pottery sample no. 12, magnification 2.3K, quartz crystal enlarged due to accumulation of other impurities
D, Scanning electron micrograph: pottery sample no. 7, magnification 1.5K, scales showing probability of fine clay particles arranged one upon another
- LXV : A, Scanning electron micrograph: pottery sample no. 7, magnification 1.5K, showing quartz crystals
B, Scanning electron micrograph: pottery sample no. 7, magnification 1.0K, showing quartz
C, Scanning electron micrograph: pottery sample no. 8, magnification 1.0K, elongated crystals
D, Scanning electron micrograph: pottery sample no. 8, magnification 1.0K, distortion of structures
- LXVI : A, Scanning electron micrograph: pottery sample no. 8, magnification 1.0K
B, Scanning electron micrograph: pottery sample no. 6, magnification 600x, quartz crystal confirmed
C, Scanning electron micrograph: pottery sample no. 8, magnification 680 x
D, Scanning electron micrograph: pottery sample no. 6, magnification 2.0K, quartz crystal confirmed
- LXVII : Dhalewan; general view
- LXVIII : Baglian Da Theh: general view
- LXIX : Lakhmirwala: general view
- LXX : Kasital: general view, before excavation
- LXXI : A, antiquities from Kesital, PGW level
B, antiquities from Kesital, medieval level
- LXXII : Manda: general view of the excavated remains
- LXXIII : A, copper spiral pin
B, fragmentary terracotta objects
C, unfinished seal
- LXXIV : Dadheri: structures of Sub-period IA and IB
- LXXV : Dadheri: Late Harappan jar embedded in a pit
- LXXVI : A, Dadheri: Late Harappan jar
B, Dadheri: excavated antiquities
- LXXVII : Nagar: oval structure from Period I
- LXXVIII : A, Nagar: excavated antiquities, Period I
B, Nagar: Terracotta seal, Period I

- LXXIX : Nagar: partially exposed walls of a room, medieval period
LXXX : A, Katpalon: excavated antiquities
B, Katpalon: excavated antiquities
C, Katpalon: excavated antiquities

LIST OF COLOURED PLATES

- A : Painted red ware designs, Sub-period IA and IB**
- B : Painted red ware designs, Sub-period IA and IB**
- C : Painted red ware, Sub-period IA and IB**
- D : Painted red ware, Sub-period IA and IB**
- E : Incised red ware, Sub-period IA and IB**
- F : Incised red ware, Sub-period IA and IB**
- G : Incised red ware, Sub-period IA and IB**
- H : Incised red ware, Sub-period IA and IB**
- I : Incised red ware, Sub-period IA and IB**
- J : Incised red ware, Sub-period IA and IB**
- K : Painted Grey Ware, Sub-period IB**
- L : Beads**
- M : Beads**
- N : Beads**
- O : Bangles**
- P : Bones of sheep and goat**

LIST OF FIGURES

- 1 : Map showing excavated sites
- 2 : Contour map of Bhagwanpura showing excavated trenches
- 3 : Bhagwanpura: Conjectural painting showing life in successive Sub-periods
- 4 : Section looking north and west
- 5 : Plan of a circular hut, Structural Phase I
- 6 : Plan of thirteen roomed house, Structural Phase II
- 7 : Conjectural elevation of oval structure
- 8 : Graph showing incidence of pottery
- 9 : Pottery of Sub-period IA
- 10 : Pottery of Sub-period IA
- 11 : Pottery of Sub-period IA
- 12 : Pottery of Sub-period IA
- 13 : Pottery of Sub-period IA
- 14 : Pottery of Sub-period IA
- 15 : Pottery of Sub-period IA
- 16 : Pottery of Sub-period IB
- 17 : Pottery of Sub-period IB
- 18 : Pottery of Sub-period IB
- 19 : Pottery of Sub-period IB
- 20 : Pottery of Sub-period IB
- 21 : Pottery of Sub-period IB
- 22 : Pottery of Sub-period IB
- 23 : Painted Red Ware, Sub-period IA and IB
- 24 : Painted Red Ware, Sub-period IB
- 25 : Incised pottery, Sub-period IA and IB
- 26 : Incised pottery, Sub-period IA and IB
- 27 : Incised pottery, Sub-period IA and IB
- 28 : Painted Grey Ware and Grey Ware, Sub-period IB
- 29 : Painted Grey Ware and Grey Ware, Sub-period IA and IB
- 30 : Painted Grey Ware and Grey Ware, Sub-period IB
- 31 : Painted Grey Ware and Grey Ware, Sub-period IB
- 32 : Painted Grey Ware and Grey Ware, Sub-period IB
- 33 : Black Ware, Sub-period IB
- 34 : Beads of semiprecious stones
- 35 : Beads of semiprecious stones
- 36 : Terracotta beads
- 37 : Terracotta wheeled ram (restored)
- 38 : Bone and ivory objects
- 39 : Inscribed terracotta tablets, Sub-period IB
- 40 : Chart showing graffiti

LIST OF FIGURES

- 41 : Chart showing incidence of animals
- 42 : Plan showing burials etc.
- 43 : Graph showing typical TL glow curves from Quartz grains extracted from ancient Indian potteries
- 44 : Graph showing evaluation of Archaeological dose (EDr) for pottery samples
- 45 : Graph showing TL glow curves from fine grains of a pot sherd excavated at Bhagwanpura
- 46 : Graph showing TL dating results for potteries excavated at Bhagwanpura
- 47 : Graph showing analysis of Black pottery sample
- 48 : Graph showing Black pottery Infra-red spectograph
- 49 : Graph showing analysis of Red pottery sample
- 50 : Graph showing Infra-red pottery sample
- 51 : Graph showing Energy Dispersive X-ray Spectograph of glass samples
- 52 : Map showing Proto-historic sites in north-west India
- 53 : Map showing extent of Harappan Culture
- 54 : Graph showing frequency of different wares at Manda
- 55 : Manda : Pottery from Sub-period IA

CHAPTER I

INTRODUCTORY

- A) General Remarks**
- B) Acknowledgement**
- C) The problem and its approach**
- D) Explorations**

Jagat Pati Joshi

80282

CHAPTER I

INTRODUCTORY

A. GENERAL REMARKS



It is widely known that during 1940-44 when Painted Grey Ware was first identified at Ahichchhatra (U.P.),¹ its significance and far reaching importance could not be realized and it was only after the excavations at Hastinapura² it got a distinct culture-label followed by considerable field work³ of immense importance carried out in the following decades and more than 848 sites associated with this culture have been identified in Punjab, Haryana, Rajasthan, Uttar Pradesh and Madhya Pradesh⁴ besides reported occurrence of the ware from Lakhiyopir (Sind, Pakistan), Harappa (Punjab, Pakistan) and Cholistan (Bahawalpur, Pakistan)⁵. From Thapli⁶ on the bank of Alaknanda, District Tehri in the Sub Himalayas in the north to Ujjain⁷ in the south, Sravasti⁸ in the east and Gharinda⁹ in the west appears to be the main area of Painted Grey Ware as such. However, in case associated Grey Ware is also taken into account, it could be extended upto Manda in Jammu and Kashmir¹⁰. In the last five decades excavations have been carried out at Ahichchhatra,¹¹ Alamgirpur,¹² Allahpur,¹³

¹ A. Ghosh and K.C. Panigrahi, 'The pottery of Ahichchhatra, District Bareilly, U.P.,' *Ancient India*, no. 1 (1946), pp. 37-59.

² B.B. Lal, 'Excavation at Hastinapura and other explorations in the Upper Ganga and Sutlej basins 1950-52: New Light on the dark age between the end of the Harappa Culture and the early historical period', *Ancient India*, no. 10 & 11 (1954 & 1955), pp. 4-151.

³ A. Ghosh, 'The Rajputana Desert—its archaeological aspects', *Bulletin of the National Institute of Sciences of India*, no. 1 (1952), pp. 37-42; Vibha Tripathi, *The Painted Grey Ware* (Delhi, 1975), pp. 21-41.

⁴ Based on documentation carried out by Miss Madhu Bala, the then Deputy Superintending Archaeologist, Archaeological Survey of India, New Delhi.

⁵ The material is in the Central Antiquities Section, Archaeological Survey of India, Purana Qila, New Delhi as reported by Prof. B.B. Lal; Bridget and Raymond Allchin, *The Birth of Indian Civilization*, Harmondsworth, Middlesex, England (1968), pp. 210-365; M. Rafique Mughal, 'New Archaeological Evidence from Bahawalpur', *Man and Environment*, vol. IV (Ahmedabad, 1980), pp. 93-98; M. Rafique Mughal, 'Post-Harappan in Bahawalpur' in B.B. Lal and S.P. Gupta (eds.) *Frontiers of Indus Civilization* (New Delhi, 1984), pp. 501-502.

⁶ K.P. Nautiyal, 'Pushing back the antiquity of Garhwal: Results of recent explorations and excavations', Paper presented at seminar on Regional Historical Writings in India with special reference to Western Himalayas, Simla, 22-25 October, 1981; K.P. Nautiyal, B.M. Khanduri, Vinod Nautiyal, D.L. Rajput and R.K. Bhatt, 'Painted Grey Ware Culture in Garhwal, Himalaya—New evidence and interpretation', *Puratattva*, no. 17, (1986-87), pp. 11-14.

⁷ *Indian Archaeology 1956-57—A Review*, p. 24.

⁸ *Indian Archaeology 1958-59—A Review*, p. 49.

⁹ *Indian Archaeology 1976-77—A Review*, p. 41.

¹⁰ Jagat Pati Joshi and Madhu Bala, 'Manda: A Harappan site in Jammu and Kashmir in G.L. Posehl (ed.), *Harappa Civilization* (New Delhi, 1982), pp. 185-95.

¹¹ A. Ghosh and K.C. Panigrahi, *op. cit.*

¹² *Indian Archaeology 1958-59—A Review*, pp. 54-55.

¹³ K.N. Dikshit, 'The Allahpur evidence and the Painted Grey Ware Chronology' in D.P. Agrawal and A. Ghosh (eds.), *Radiocarbon and Indian Archaeology* (Bombay, 1973), pp. 148-153.

Atranjikhhera,¹⁴ Bhagwanpura, Dadheri,¹⁵ Daulatpur,¹⁶ Hastinapura,¹⁷ Hulas,¹⁸ Jakhera,¹⁹ Jodhpura,²⁰ Kathapalon,²¹ Mathura,²² Nagar,²³ Noh,²⁴ Raja Karan Ka Qila,²⁵ Sanghol,²⁶ Sravasti,²⁷ and Ujjain²⁸. Except Bhagwanpura and Jakhera, most of the sites have been excavated in the vertical fashion giving a culture-sequence. Excavation at Alamgirpur, Hastinapura and Ropar and explorations and excavations in the valleys of Sarasvati and Drishadvati in north-western Rajasthan revealed that there was a hiatus between the Harappa Culture and the Painted Grey Ware Culture in these areas. The date of Painted Grey Ware has been assigned by archaeologist between *circa* 1100 B.C.-500 B.C.²⁹ Mention may also be made that Painted Grey Ware has also been associated by archaeologists with later Aryans and the Mahabharata. This was the position when excavation was envisaged at Bhagwanpura in 1975-76 field season.

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¹⁴ R.C. Gaur, *Excavations at Atranjikhhera* (Delhi, 1982).

¹⁵ J.P. Joshi, 'Interlocking of late Harappa Culture and Painted Grey Ware Culture in the light of recent excavations', *Man and Environment*, vol. II (Ahmedabad, 1978), pp. 98-101.

¹⁶ B.B. Lal, *op. cit.*

¹⁷ B.B. Lal, *op. cit.*

¹⁸ K.N. Dikshit, 'Excavations at Hulas and further exploration of the Ganga-Yamuna Doab', *Man and Environment* vol. V (Ahmedabad, 1981), pp. 70-76.

¹⁹ M.D.N. Sahi, 'New light on the life of the Painted Grey Ware people as revealed from excavation at Jakhera (District Etah)', *Man and Environment*, vol. II, (Ahmedabad, 1978), pp. 101-103.

²⁰ R.C. Agrawala and Vijai Kumar, 'The problem of PGW and iron in north-eastern Rajasthan', in S.P. Gupta and K.S. Ramchandran (eds.) *Mahabharata - Myth and Reality* (Delhi, 1976), pp. 240-244, 263, illus.

²¹ Jagat Pati Joshi and Madhu Bala, *Op. cit.*

²² *Indian Archaeology 1975-76—A Review*, pp. 53-55; Herbert Haertel, 'Some results of the excavations at Sonkha in German Scholars on India' (ed) Embassy of Federal Republic of Germany, vol. II, (New Delhi, 1976), pp. 69-99.

²³ Jagat Pati Joshi, *op. cit.*

²⁴ R.C. Agrawala and Vijai Kumar, *op. cit.*

²⁵ Suraj Bhan and Jim G. Shaffer, 'New Discoveries in northern Haryana', *Man and Environment*, vol. II (1978), pp. 59-68; *Indian Archaeology 1968-69—A Review*, pp. 8-9, and 1970-71, pp. 15-16.

²⁶ *Indian Archaeology 1968-69—A Review*, pp. 25-26; C. Margabandhu and G.S. Gaur, 'Sanghol Excavations', *Puratattva*, no. 17 (1986-87), pp. 1-4.

²⁷ K.K. Sinha, *Excavations at Sravasti—1959* (Varanasi, 1967), p. 77. Farther east and north-east PGW is reported from Vaishali (*Indian Archaeology 1958-59—A Review*, p. 12) and Tilaurakot, Nepal in D. Mitra, *Tilaurakot* (Calcutta, 1972), p. 23.

²⁸ *Indian Archaeology 1956-57—A Review*, p. 20. PGW is also reported from Kayatha, M.P. (V.S. Wakankar, Kayatha Excavation, *The Vikram : Journal of the Vikram University* (1965), p. 45.

²⁹ B.B. Lal, 'Did Painted Grey Ware continue upto the Mauryan Times', *Puratattva*, no. 9 (1977-78), pp. 64-80.

INTRODUCTORY

thankful to Dr. (Smt.) Debala Mitra, the then Joint Director General who took considerable interest throughout and gave me valuable guidance during the excavations at Bhagwanpura.

I owe a deep debt of gratitude to Shri R.S. Bisht, the then Deputy Director,³⁰ Deptt. of Archaeology, Govt. of Haryana for showing me the site at Bhagwanpura which he had earlier discovered during his exploration of the area. I would also like to thank Shri Bisht and Dr. Arun Kumar, Deputy Superintending Archaeologist for providing me important material and references on Sarasvati.

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Miss Madhu Bala, the then Technical Assistant³¹ was author's Chief Assistant throughout the exploration of sites and excavations at Bhagwanpura, Dadheri, Katpalon, Nagar and Manda besides she looked after the camp at various sites including the one at Bhatinda which was a base camp for exploration of District Manda and where training was imparted to the students of School of Archaeology, now raised to Institute of Archaeology. She also classified the pottery and antiquities and did all the counting of excavated pottery for compiling statistical data for the report. She has independently contributed the chapters on Pottery and Other finds and jointly contributed two other chapters in the report beside assisting the author in the preparation of the report.

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Shri Jassu Ram Batra, Draftsman Grade-I³⁴ prepared all the section and plans at Bhagwanpura and other sites and later prepared the pottery drawings besides providing assistance in camp administration. Shri Vijay Kumar, Marksman,³⁵ joined us at Dadheri, prepared drawings in the field and has ably prepared the publication drawings of the report. Shri J.C. De, Surveyor,³⁶ prepared the contour plan of the mound at Bhagwanpura which was extremely helpful in locating intact portions of the ancient habitation. Shri L.K. Jain prepared the excellent painting for the cover.

Shri G.Laxminarayan, Photographer Grade-I,³⁷ besides field photography actively helped in excavations and later did photography of the small finds in the Headquarters. Shri B.R. Rajput also photographed the antiquities for publication. Shri Manohar Lal Nagar, Marksman looked after the Pottery yard at Bhagwanpura and other sites and made available the pottery meticulously for the report. Shri Kapil Deo, Modeller helped in mending and restoring pottery. Late Shri D.P. Sharma Works

³⁰ Shri R.S. Bisht is presently the Course Director, Institute of Archaeology, Archaeological Survey of India (ASI).

³¹ Miss Madhu Bala is presently Deputy Director, Institute of Archaeology, (ASI).

³² Shri. S.N. Jayaswal is presently Deputy Superintending Archaeologist, (ASI).

³³ Shri A.K. Sharma has since retired as Superintending Archaeologist, (ASI).

³⁴ Shri Jassu Ram Batra retired as Senior Draftsman, (ASI).

³⁵ Shri Vijay Kumar is presently Chief Artist, (ASI).

³⁶ Shri J.C. De, is presently Manager, RITES, Calcutta.

³⁷ Shri G. Laxminarayan, Photographer Grade-I, retired as Senior Photographer.

Assistant Grade-I, looked after the camp office. Late Sarvashri Sriram and Hari Singh, Daftri provided excellent liaison between the office and the field and looked after all the inmates with care.

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Out side the Survey, quite a few scholars have contributed towards this report. Dr. K.S. Nambi and Sarvashri R. Sasidharan and S.D. Soman of BARC, Bombay, whose report on TL dating of pottery from Bhagwanpura has been incorporated. This report was originally published under BARC 1013 in 1979. Presently, relevant portion relating to Bhagwanpura has been incorporated which is gratefully acknowledged. Dr. S.C. Tewari and Sarla Banerjee of Delhi University have kindly contributed a chapter on morphometric analysis of human skeletal remains, which is gratefully acknowledged. Dr. R.V. Joshi of Deccan College, Pune graciously contributed a note on soil analysis to the report. I am beholden to all these scholars for their kind co-operation.

Shri O.N.Rattan,⁴² Stenographer, took the dictations of all the field notes, Shri Dhanpal, Stenographer, typed out the first draft and Shri R.Y. Krishna Rao, Stenographer finally typed out the report with care and precision. My most grateful thanks are due to them

During the course of excavations, the site of Bhagwanpura was visited by Sarvashri B.K. Thapar, K.V.Soundara Rajan, Dr. Y.D.Sharma (Punjab University), Prof. B.B. Lal (I.I.A.S. Shimla), Prof. F.R. Allchin (Cambridge University), Prof. Udai Vir Singh and Prof. Suraj Bhan (Kurukshetra University) and G.B. Sharma, Deptt. of Archaeology (Govt. of Punjab). Their visits gave an opportunity of free discussions at the site which has been of tremendous importance to me and colleagues of my team.

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⁴¹ Shri B.N. Tandon retired as Joint Director General, ASI.

⁴² Sarvashri Manohar Lal, Kapil Deo, Amarnath Khurana, Shivnath, Mehar Chand and O.N. Rattan have since retired from the ASI.

Prof. Udai Vir Singh was kind to pay many visits to the site and had been of considerable help throughout our stay in the camp.

I also wish to record my gratitude to Shri M.C. Joshi, Director General, the author's successor in the Archaeological Survey of India for providing me facilities in connection with the completion of the report after my retirement and to Smt. Achala Moulik, Chief Executive Officer and Additional Director General (Administration) for giving secretarial facilities.

I take this opportunity to record my sincere thanks to all those associated with the production of the volume specially Sarvashri B.M. Pande, Director (Publication), Chhering Dorje, Superintending Archaeologist, J.C. Gupta, Production Officer, A. Jha, Assistant Archaeologist and other colleagues in the Publication Branch of the Headquarters of the Director General's office for publishing it in record time. Shri Dorje also volunteered to prepare the Index for which I am grateful to him. M/s Bengal Offset Works deserve congratulations for the printing of the report in such a nice manner.

At the end, I would like to thank my wife Smt. Heera Joshi who has helped me in recording the designs of Painted Grey Ware at Bhagwanpura besides helping me in various ways in the field and during preparation of the report.

C. THE PROBLEM AND ITS APPROACH

Bridging of the gap between the Harappa Culture and Painted Grey Ware Culture had remained vital problem during all these years. The position was very well summed up by A. Ghosh⁴³ who remarked "the evidence just now obtained from the Ropar excavation that the Harappans predeceased the advent of the Painted Grey Ware people. This may be true of Ropar but other sites, having a different tale to relate, may not be lacking. While, therefore, it is admittedly premature to hold that the latter people were no other but the Aryans, it is doubly premature to say that the Aryans had nothing to do with the disappearance of the Harappans. Even if that be the future consensus, the possibility will remain that the descendants of the Harappans, after the end of their glorious days, lived somewhere in India, still holding to their culture, in a modified form, to contribute its traits to one pattern of Indian culture will remain unexplained."

The various excavations done mostly in the vertical style in the Painted Grey Ware yielding sites have given a ¹⁴C date bracket of *circa* 1100 B.C. to 700 B.C. The sites have given evidence of the association of iron with Painted Grey Ware. It was long felt some Painted Grey Ware site should be excavated horizontally to get a complete idea of the culture-components widely supposed to have been associated with the eastward movement of the Aryans in India in the region of Jammu, Punjab and

⁴³ A. Ghosh, Editorial Notes, *Ancient India*, nos. 10 & 11, pp. 1-5; A. Ghosh, *The City in Early Historical India* (Simla, 1973), pp. 9-11; B.K. Thapar, 'The Aryans: a reappraisal of the problem' in Lokesh Chandra, S.P. Gupta, Devendra Swarup and Sitaram Goel (eds.), *India's Contribution to World Thought and Culture* (Madras, 1970), pp. 161 and 164; B.B. Lal, 'The Indo-Aryan Hypothesis vis-a-vis Indian Archaeology', Paper read at the Seminar on Ethnic Problems of the early history of the peoples of Central Asia and India in the second millennium B.C. held at Dushanbe, p. 30; R.S. Sharma, *Material Culture and Social Formations in Ancient India*, 1983, pp. 23-24, 172-173; S.B. Roy, *Date of Mahabharata*, (Delhi, 1976), p. 198; Jagat Pati Joshi, 'The Mahabharata and Indian Archaeology' in B.M. Pande and B.D. Chattopadhyaya (eds.), *Archaeology and History* (New Delhi, 1988), pp. 20-34.

Haryana and also its relationship, if any, to the aftermath of the Harappa Culture. Of particular interest was to find out the position of Painted Grey Ware on a site on the bank of river Sarasvati, where Vedic sacrifices are supposed to have been performed according to the literary evidence and Ailusha achieved rishihood by worshipping Sarasvati.

Following Dr. D.C. Sircar's views as reported in the newspapers in 1975 that the Mahabharata War is not a historical event, there was acrimonious debate in the press and many learned papers were also written. It must be said that such controversial problems could have been better discussed in a more serious forum and the problem analysed threadbare and in greater detail by historians, archaeologists and other social scientists. It is amusing to note the diametrically opposite views were expressed regarding the epic, the tradition of which is engraved in the minds of the masses of India. This can only cause confusion and is bound to bring discredit to scholars. It has become fashion to push back dates in history, glorify epic characters or try to show the past more hoary than what it really is. The Mahabharata is no doubt a great literary work and is classed as a *mahakavya*; it is a veritable mine of information on various aspects of Indian life and culture through the centuries. The traditionalists regard it as *Itihasa*; it is also considered as the *Panchama Veda*, i.e. fifth book of knowledge. As a result, whatever is mentioned in this great epic is taken by an average Indian to be sacred and gospel truth. A serious student would, however, like to analyse the event and the culture associated with it objectively without any preconceived notions and prejudices. Archaeology as a science aims at curbing the tendency of fabricating history by culling material from myths, lores and legends. An archaeologist's task is to unveil truth and not to romanticize the cavalcade of history and quantify abstractions.

The Mahabharata in its available form is a late composition, perhaps of the Gupta period. It contains the cumulative experience of Indian society for ages in an encyclopaedic form. Some of the events mentioned in it are no doubt considered to have taken place earlier. It is well known that the epic centres round the Great Bharata War which is taken by scholars to have been fought variously in *circa* 3100 B.C., 1900 B.C., 1400 B.C. and 900 B.C. These dates were based on deductions on variable facts and are not supported by any archaeological evidence.

In fact, it is rather difficult to produce evidence of a war of this kind alleged to have been fought in a battlefield. At the same time, in the present state of archaeological research we have hardly any ground to deny the veracity of the tradition. A war might have been fought but its magnitude and historicity have yet to be established on scientific grounds.

Let us now examine briefly the various theories regarding the date of the Bharata War.

During 3100 B.C., the Kuru-Panchala region presently Haryana and Uttar Pradesh was full of forests with no trace of urban settlements. Incidentally, the earliest urban centres of India are those associated with the Harappan Culture datable from 2350 B.C. to 1750 B.C., according to the latest 14-C determinations, if not earlier. To place the Mahabharata prior to the rise of Harappan Culture is unfounded, nor can the culture depicted in the Mahabharata be associated with the material remains of the Harappan Culture or the Indus Civilization. So far the second date of 1900 B.C. to 1400 B.C. based on astronomical-cum-dynastic chronology and the third date of 1400 B.C. is concerned, we have during this period cultures like the late Harappan, post-Harappan Cemetery H, Bara and PGW cultures in the Kuru region and a culture popularly associated with some Copper Hoards in the Panchala region.

INTRODUCTORY

Unfortunately, these are not associated with urbanized life as depicted in the Mahabharata. The last suggested date, 900 B.C. falls well within the Iron age so far as the Kuru-Panchala region is concerned. The material evidence available to this day from Painted Grey Ware sites however suggests a pastoral-cum-agricultural economy.

We may digress here to just point out that the association of the Painted Grey Ware with one or other wave of Indo-Aryan speaking people is rather interesting and needs further field work. This distinctive ware has not been found beyond the north-western frontier of Indo-Pakistan subcontinent but local adaptations in the region of provenance i.e. Madhyadesa could not be ruled out. Regarding later Aryans, views of A. Ghosh, B.K. Thapar, B.B.Lal and R.S Sharma are very relevant and maybe referred.

The available archaeological remains including the identification of flood-scar in a trench at Hastinapura following a Puranic reference and the discoveries of Painted Grey Ware in some of the sites associated with the Mahabharata story do not prove the existence of an urbanized culture as is evidenced in the Mahabharata.

With a view to finding a solution to the above problems of the Dark Age, a small team of the Exploration Branch of the Archaeological Survey of India under the direction of the author, carried out intensive explorations and documentation of earlier explored sites during the field seasons 1975-76 and 1976-77 in District Kurukshetra (Haryana), Ludhiana, Jalandhar, Ferozpur, Amritsar, Gurdaspur (all in Punjab) and Manda (Akhnoor), District Jammu (Jammu and Kashmir). It is proposed to give in brief below the results of these explorations and documentation.

D. EXPLORATIONS

The explorations brought to light that the sites in District Gurdaspur contain only grey ware associated with Painted Grey Ware and late Harappan Red Ware. Painted Grey Ware as such was not available. The main sites are Kanwa, Dodwan, Haripur, Lohagarh, Hardeo Rawal Khurd, Gurdas Nangal Da Theh. In District Amritsar while the northern side is devoid of Painted Grey Ware, at Gharinda west of Amritsar towards the border, at a distance six kilometres before Attari, Painted Grey Ware, grey ware and a few late Harappan sherds are available. In District Ferozpur, the site at Sosan, Painted Grey Ware, Grey Ware and Late Harappan Ware are available. In District Jalandhar, Painted Grey Ware, Grey Ware and late Harappan Ware was found at Aparā, Haripur and Chini Kanjri Ka Ther. In the north-western side of the same district Grey ware and Black ware was available at Malsian, Karalan and Kartarpur. On the eastern side of the district, Nagar and Katpalon yielded the evidence of Painted Grey Ware, Grey Ware and Late Harappan Ware. Similarly at Dadheri, District Ludhiana and a few sites like Pipli and Garhi Radam and Bhagwanpura in District Kurukshetra yielded Painted Grey Ware, Grey Ware and Late Harappan Ware.⁴⁴

Distribution of PGW Sites

In Ghosh's exploration of Bikaner area, twenty sites containing PGW were found along the

⁴⁴ Report, Ministry of Education & Social Welfare, 1977-78 (New Delhi), p. 198.

Sarasvati and one with coarse variety was found along the Drishadvati. Many new types were met with which no doubt represent the locations of the Painted Grey Ware people. Subsequently many PGW sites were located in Cholistan in the Bahawalpur region of Pakistan by Mughal.

The distribution pattern of the PGW sites generally shows that during the PGW times, some of the major rivers were preferred since the middle courses of river like the Ghaggar, Sarasvati and Drishadvati had rejuvenated. The direction of movement remained the same—west to east. The new areas were palaeo-Yamuna channel in Bahawalpur district of Pakistan and the Ganga in the north-western U.P. The extension was more or less in the same region of Copper Hoards or Ochre Colour Ware or where late Harappan wares proliferated.

The distribution of sites of Grey Ware associated with Painted Grey Ware are : Jammu (1), Punjab (109), Haryana (46), western Uttar Pradesh (24), Rajasthan (8); and P.G. Ware are : Haryana (258), Punjab (108), U.P. (218) and Rajasthan (101). Generally, according to a study of 43 sites on the basis of size of the mound, the population varied from 200 to 1500-2000 persons in 1.1 to 2.1 hectares.⁴⁵ The biggest Painted Grey Ware settlement is Satwadi in Cholistan, Bahawalpur⁴⁶ (Pakistan) which is 13.7 hectares.

A. Ghosh has said “PGW age is an important land mark in the archaeology of north India. It coincides in time and space with later Vedic Age which may be regarded as proto early age of India”.⁴⁷ Keeping in view the above problems, the site of Bhagwanpura was taken up for excavations.

⁴⁵ Documentation done by Miss Madhu Bala, the then Deputy Superintending Archaeologist; R.S. Sharma, *Material Culture and Social Formations in Ancient India*, New Delhi, 1983, pp. 172-173.

⁴⁶ Rafique Mughal, ‘Post Harappan in Bahawalpur’ B.B. Lal and S.P. Gupta (ed.), *Frontiers of the Indus Civilization*, (New Delhi, 1984), p. 501.

⁴⁷ A. Ghosh, *Op. cit.*, pp. 5-7.

CHAPTER II

THE SETTING

- A) The Site**
- B) Discovery**
- C) Environments**
- D) Sarasvati**

Jagat Pati Joshi

CHAPTER II

THE SETTING

A. THE SITE

The ancient site at Bhagwanpura, District Kurukshetra, Haryana (Lat. 30°04' N; Long. 76°57' E) is situated at a distance of 24 km north-east of the district headquarter at Kurukshetra (fig. 1). The site can be approached by a *pucca* macadamized road from Kurukshetra *via* Kolhapur and Marcheri. The strip of about six kms between Kolhapur and Marcheri is *kuccha*. The site can also be approached from Kurukshetra *via* Ladwa and Babain. The ancient site is located 350 m to the south of village Bhagwanpura falling in the same village limits. The mound is situated on the right bank of river Sarasvati. The river is mostly dry. The maximum available height of the mound is 2-40 m. above the present level of the adjoining area (pls. I-III).

B. DISCOVERY

During the course of his explorations, the site was discovered in 1974 by Shri R.S. Bisht, the then Deputy Director of Archaeology, Government of Haryana and now Director, Archaeological Survey of India. With a view to locate a site having Painted Grey Ware and Late Harappan Ware, the site was kindly shown by Shri Bisht to the author in August 1975. The site as such was not impressive as it looked to be quite eroded but closer examination revealed that it was having potential archaeological remains and finally after an extensive exploration of the mound the author decided to excavate the site.

C. ENVIRONMENTS

The mound at Bhagwanpura is, very low and can only be sighted from a close distance by the contrast of the colour of the soil which is yellowish coming up in slight relief from the adjoining green fields. Grey and red pottery spread over the mound adds further sprinkling of colour and makes the spotting of the surface of the mound easier. This mound at Bhagwanpura is surrounded by a few trees of *Kikar* (*acacia arabia*). Presently, the river Sarasvati is about half a kilometer away from the mound. It has been locally reported that during the rainy season, a sheet-flooding girdles the lower reaches of the mound. An examination of the mound does indicate that in the recent past also heavy flood waters of river Sarasvati might have also added to the reduction of the size of the mound. The process of damaging of mound and reducing it to present size might have taken centuries (fig. 2).

D. SARASVATI

The river Sarasvati at present appears to be like a small *nallah* in the dry season in the areas covered by Ambala and Kurukshetra Districts. During the rainy season, however, its nature changes and the considerable water in its now shallow bed does sheet-flooding near the mound at Bhagwanpura. At

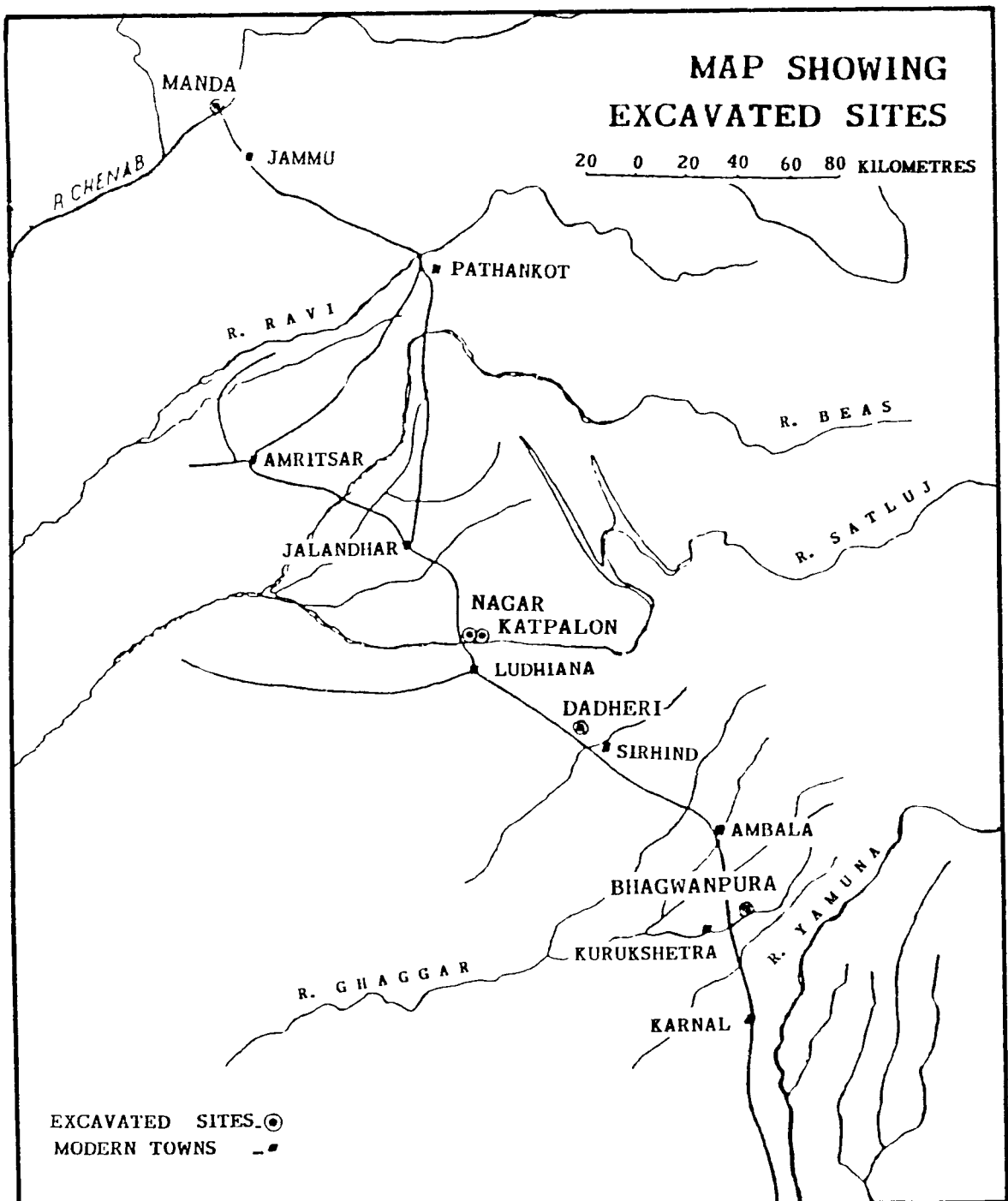


FIG 1 : Map showing excavated sites

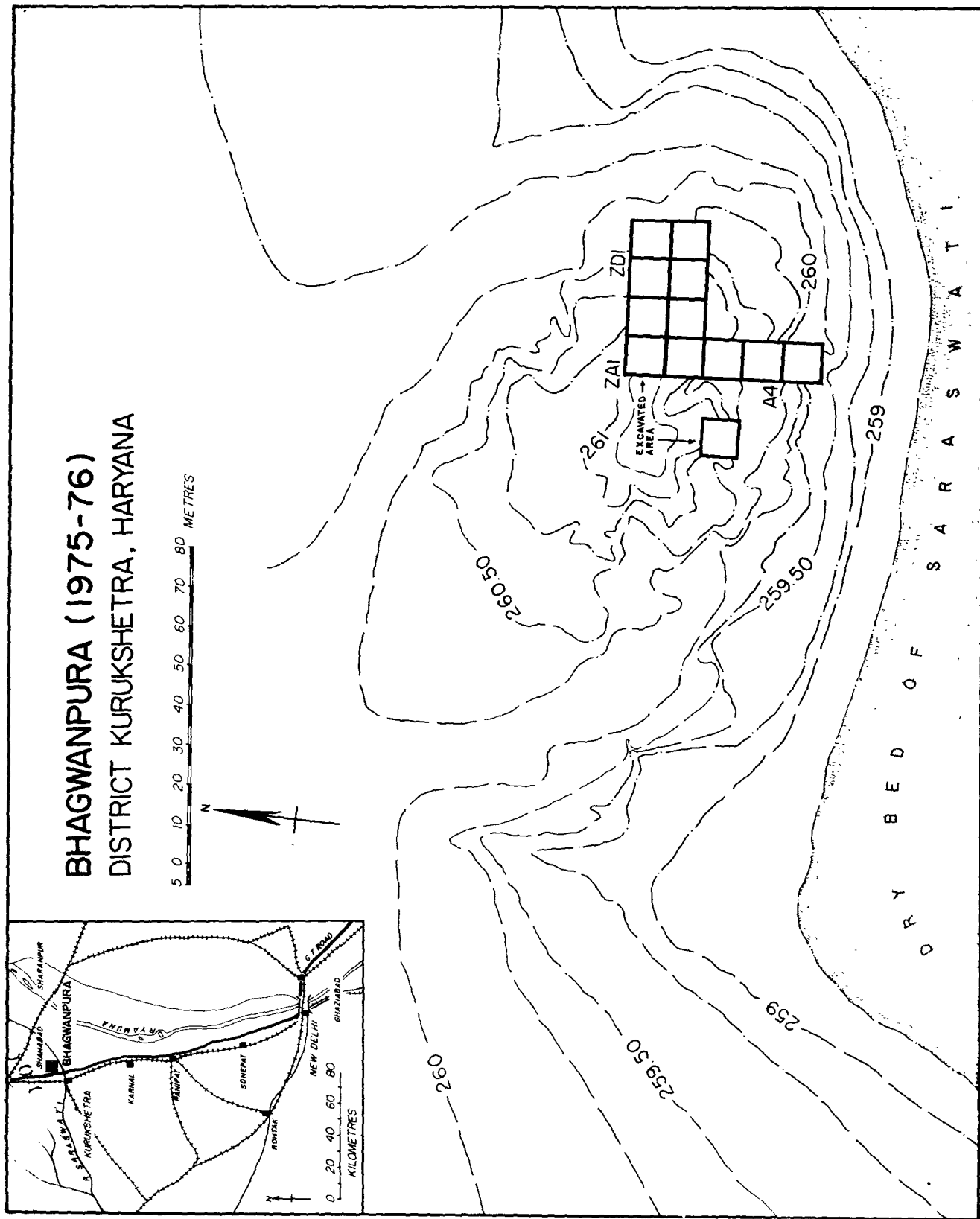


Fig 2 : Contour map showing excavated trenches

places the area of this sheet-flooding is up to 1 km. on each side, creating thereby a great havoc to both life and property.

In ancient times, the situation was quite different. In the Rigveda, however, Sarasvati is mentioned and invoked with intense feelings and profound reverence by the seers who dedicated one complete hymn, sections of five other and several other verses in its praise.¹ Once it is mentioned as the “seventh among the seven sindhus” (rivers) and addressed as “*Sindhumata*”² (सरस्वती सप्तथी सिन्धुमाता). It along with its sister rivers formed the eastern most boundary of the land settled by the Rigvedic Aryans.

Apart from its aspect as a physical river having an immense role in material life, it also played a great role in the spiritual, religious and creative life of the Rigvedic Aryans. It is extolled as the inspirer of good songs and inciter of good thought (चोदयित्री सुनृतानां चेतन्ती सुमतीनाम्)³ or as the one which generates and illuminates with her standard all intelligence.⁴ Two Bharata princes are shown performing a sacrifice on its bank.⁵ On the material side, it is described not only as the destroyer of such tribes as Parvatas⁶, Vratas⁷ and Panis⁸ but also as the promoter of the five tribes of the Aryans⁹ or as accommodating several pioneers lorded over by a king and for its Aryan proteges,¹⁰ it was a protection like a brazen fort (अयसीपः)¹¹. She is described variously as dear among the dearest ones (प्रिया प्रियासु)¹², great among the greatest ones and mightiest stream among the rivers (महिम्ना महिनासु and अपसामपस्तमा)¹³. There could have been no greater respect paid to her then by and Goddess par excellence (अम्बितमे नदीतमे देवितमे).¹⁴ It is also described as one who sweeps away ridges of the hills with her mighty waves¹⁵ while running from the hills to the sea¹⁶ (एकाचेतत्सरस्वती नदीनां शुचिर्यती गिरिभ्यः आसमुद्रात्). In the later vedic literature, however, the Sarasvati ceases to be the river par excellence and it has instead been deified perhaps in order to perpetuate the memory of its old importance. This cessation was a gradual process and its faint beginning seems to be reflected even in the Rigveda where a seer earnestly prays her not to spurn his people from her milk nor force them to leave her fields and forests and fervently requests her to nourish them with her friendly care¹⁷.

Though it is a mature stream, at least in its upper course where it flows in a narrow but deeply entrenched bed with two or three low terraces affected by sheet-flooding in the event of heavy summer

¹ M.L. Bhargava, *Geography of Rigvedic India*, (Lucknow, 1964), p.91

² *Rigveda*, VIII.36.6 - सरस्वती सप्तथी सिन्धुमाता।

³ *Ibid.*, I.3.11 - चोदयित्री सुनृतानां चेतन्ती सुमती नाम्।

⁴ *Ibid.*, I.3.10 - वाजेभिर्वाजिनीवती।

⁵ *Ibid.*, RV. III.23.4 - दृषद्वत्यां मानुष आपयायां सरस्वत्यां दिदीहि।

⁶ *Ibid.*, VI. 61.2 - इयं शुष्मेभिर्बिसरवा इवारुजन् सानु गिरीणां तवषेभिरुमिभि।

⁷ *Ibid.*, VI. 61.5.7 - पारावतघ्नीमवसे सुबृत्तिभिः सरस्वतीमाविवासेम धीतिभिः।

⁸ *Ibid.*, RV. VI.61.1

⁹ *Ibid.*, VI. 62.23; VII.96.2

¹⁰ *Ibid.*, VII. 21.18

¹¹ *Ibid.*, VII. 95.1

¹² *Ibid.*, VI. 61.10

¹³ *Ibid.*, VI. 61.13

¹⁴ *Ibid.*, II.41.16

¹⁵ *Ibid.*, VI.61.10

¹⁶ *Ibid.*, VII.95.2 - एकाचेतत्सरस्वती नदीनां शुचिर्यती गिरिभ्यः आसमुद्रात्।

¹⁷ *Ibid.*, VI. 61.40

rainfall in its catchment area, it had already developed a highly meandering course by the time of the *Panchavimsa Brahmana*¹⁸. These meandering scars are the present series of ox-bow lakes which seem to have lent credence to the name Sarasvati being interpreted as literally meaning one having pools and lakes. It appears that these lakes and pools of the Sarasvati became in course of time important religious as well as socio-economic centres¹⁹.

Its desiccation seems to have been complete by the time of the Mahabharata where it is stated to issue from the *Plaksha prasaravana*,²⁰ now located in the lesser Himalayas and, passing through several lakes, holy spots and forests, to disappear in the sandy desert (गच्छत्यर्हिता यत्र मरुपृष्ठे सरस्वती)²¹ at Vinasana,²² beyond which its course seems to be quite conjectural and conventional²³. There is a vivid geographical account woven with mythological anecdotes in relation to the course of the Sarasvati from the Himalayas to the sea which it meets beyond Rudrakoti²⁴ or even at Prabhasa.²⁵ Bhargava²⁶ has traced that course on the Survey of India maps and Cunningham²⁷ has identified a number of traditionally sacred places perching on its banks.

Today, four separate streams, all issuing from the Siwaliks bear the name of Sarasvati. However, the local tradition, as noted by Cunningham too, holds the easternmost stream, emerging from the outer slope of the Siwaliks at a place called Adibadri, most sacred among all. It joins the Somb, now a tributary of the Yamuna, perhaps as a result of diverting it by Firuz Shah Tughlaq in order to feed the western Yamuna canal, as held by Bhargava.²⁸ He points out that a branch which is thrown out by this stream a little above Katgadh, passing through Ranjitpur and Mughalawali, enters the bed of Sarasvati at Rampur-Hedian. In its onward march, this branch passes through Kapalmochan, Ramnagar, Bhawanpura, Pipli, Thaneswar (ancient *Sthanesvara*), Kurukshetra, Pehoa (*Prithudaka*), Bahar-Jakh (place of one of four guardian *yakshas*) and Sagra. At the last mentioned place it is joined by Ghaggar. A combined stream runs in the old bed of the Sarasvati further south-west, 2 km west of Makorar where the stream abandons the old bed of the Sarasvati and suddenly takes almost a right angle turn towards north-west due to some strong natural factor. However, Johya nallah runs past Bavangadh, Puromajra, Chuharpur, Dharsul-Kullan, Kunal (a proto-historic site yielding pre-Harappan, Harappan, post-Harappan and PGW remains), Bhirrana (Harappan), Ayalki-Fatehabad, Banawali (pre-Harappan, Harappan and post-Harappan), Sadar Ahli, Jokhka, Sirsa, Ellenabad, Hanumangarh, Kalibangan (pre-Harappan and Harappan) and Rangmahal. At the last mentioned place, it is joined by the old bed of Drishadvati. It is however, pertinent to mention that Makorar onwards the flood-plain of the 'lost' Sarasvati is known

¹⁸ *Panchavimsa Brahmana* XXV.10.11 तस्मात् सा कुब्जमतीव।

¹⁹ cf. *MBH.* 9.36.51 - ततः कुब्जान्वहन्कृत्वा संनिवृत्ता सरिद्धरा।

²⁰ *MBH.* III.82.5, 88.3; IX. 53.11.

²¹ *MBH.* III.80.118.

²² *MBH.* IX. 36.1 - ततो विनशनं राजन्नाजगाम हलायुधः। शूद्रान्भीरान्प्रति द्वेषाद्यत्र नष्टा सरस्वती॥

²³ cf. *MBH.* IX.34 to 53; *Panchavimsa Brahmana*, XXV 10.1; *Katyayana Srauta Sutra* X.15.1 and *Manu Smriti* 11.21.

²⁴ *MBH.*, III.80. 124-130.

²⁵ *MBH.*, III.80.79; IX. 18.69.

²⁶ Bhargava, *Op.cit.*, pp. 70.74 and 78.86.

²⁷ Alexandar Cunningham, *Report on a tour in the Punjab in 1878-79*, Vol. XIV (Delhi 1970 reprint), pp. 86-106.

²⁸ Bhargava, *Op. cit.*, p. 71.

as Sotar valley and is famous for its fertile soil, verdant fields and sweet and potable ground-water. Local tradition at places retains in its memory its another name, i.e. Hakra. The ancient run of Johya nallah from Fatehabad to Sadar-Ahli has been straightened out in connection with an irrigation canal called Rangoi. Downwards from Otu near Sirsa, the Ghaggar starts to flow in the combined bed. From Rangmahal onward, the old course is traceable along Suratgarh, Anupgarh, Fort Abbas, Maujgarh, Marot, Derawar Fort, Falji Fort, etc. Somewhere here, it was possibly joined by Sutlej and ran into the eastern Nara which occasionally carried the flood-water of the Indus. The southward Nara, the Mihran of the Arab geographers,²⁹ ran nearly parallel to the course of the latter till it passed through the Great Rann of Kutch and joined the Sea through the Kori Creek.

The above delineation of the course of the Sarasvati appears to be quite impressive and tallies well with the description in the *Rigveda* which projects it as a mighty river indeed and which was dotted by their settlements where they performed sacrifices and created a good bulk of the hymns. By the time of composition of the Mahabharata, which possibly provides the picture of the transitional age, the Sarasvati was already on the path of desiccation. And in the historical times it was possibly never destined to meet the sea.

Archaeologically, the flood-plains of the Sarasvati and its major as well as minor tributaries contain a remarkably high density of ancient settlements ranging from the pre-Harappan to medieval times. Particularly, the existence of a large number of settlement of pre-Harappan, Harappan, late Harappan, P.G.W. and Rangmahal periods points to favourable conditions whether man made or otherwise. Special mention may be made of such well-known proto-historic settlements like Rakhigarhi, Arada, Jind and Asand on the Drishadvati and Kalibangan, Banawali, Kunal, Panditona-kā-Tila, Bhagwanpura, Kasital, Raja Karan-ka-Qila, Pehoa on the Sarasvati, besides several historical ones. This archaeological richness has compelled archaeologists and environmental scientists to address themselves to find out a logical reason. There are four schools of opinion : (i) that the climatic condition in the past, particularly during the proto-historic and late historical times, was wetter facilitating the Sarasvati and some of its tributaries to be perennial or nearly perennial; (ii) there had been no significant change in the environment during the past 5000 years; (iii) The Sarasvati experienced a cycle of wet and dry phases depending on its being joined by perennial rivers like the Yamuna or the Sutlej; and (iv) some tectonic movement, occurring probably in second millennium B.C. delinked the Sarasvati and its tributaries from the perennial source of water of the higher Himalayan region.

Those who believe that favourable weather conditions or moist climatic phase caused flourishing of the protohistoric cultures include Stein³⁰, Marshall³¹, Piggott³², Wheeler³³, Ghosh³⁴, G. Singh³⁵,

²⁹ Sir John Marshal, *Mohenjo-daro and the Indus Civilisation*, Vol. I (London, 1931), pp. 5-6.

³⁰ A. Stein, *An Archaeological Reconnaissance in North Western India and South Eastern Iran* (London 1937).

³¹ Marshal, *Op. cit.*

³² S. Piggott, *Prehistoric India* (Harmondsworth, 1950).

³³ R.E.M. Wheeler, *Indus Valley Civilization* (London 1953).

³⁴ A. Ghosh, 'The Rajputana Desert—its Archaeological Aspects', *The Bulletin of the National Institute of Science of India*, Vol., I, 1952, pp. 37-42.

³⁵ G. Singh, 'Indus Valley Culture (Seen in the context of Post-Glacial Climate and Ecological Studies in North-West India)', *Archaeology and Physical Anthropology in Oceania*, Vol. 6, No. 2, 1971, pp. 177-189; G. Singh, R.D. Joshi, S.K. Chopra and A.B. Singh, 'Late Quaternary History of Vegetation and climate of the Rajasthan Desert, India', *Philosophical Transactions of the Royal Society of London*, 267 (889), 1974, pp. 467-501.

THE SETTING

Bryson and Swain³⁶ etc. While the first five scholars draw their conclusions mainly from the archaeological evidence, Singh *et.al.*, on the basis of Polynological studies carried out on restricted scale in the Sarasvati valley and in the areas of Sambar, Didwana, Lunkaransar and Pushkar, expounded that there were generally wetter climatic conditions prevailing in Rajasthan from 1000 to 3500 B.P. They further elaborate that there was a markedly wet period between 5000 and 3500 B.P. followed by a phase of severe aridity between 3000 to 2000 B.P. and further that after 2000 B.P. the climate acquired its present character. He, therefore, believes that there was a favourable palaeo-ecological period which facilitated phenomenal growth of the Copper-Bronze age culture in that region. If we go by this theory, the period covered by PGW and NBP cultures, was under serious aridic stress which might not have allowed dense occupation, whereas, from the beginning of the Christian era, better conditions prevailed again allowing the growth of large scale occupation by the authors of the Rangmahal culture.

It is interesting to note that Ghosh³⁷ came to an identical conclusion on the basis of archaeological evidence that he gathered in the course of his exploration in north Rajasthan. It seems quite curious that the ancient literature, as mentioned earlier also, indicates somewhat similar palaeo-ecological situation.

Chawdhury and Ghosh,³⁸ Raikes and Dyson,³⁹ Fairservice,⁴⁰ Allchins,⁴¹ Thapar,⁴² Leshnik,⁴³ Meher Homji,⁴⁴ Courty and Fedorff,⁴⁵ Courty,⁴⁶ believe that there have been no significant climatic change during the past 5000 years. Rather it remained more or less what prevails now. Durrani,⁴⁷ also came to the similar conclusion after detailed studies which he made in the lower Indus Valley.

³⁶ R.A. Bryson and A.M. Swain, 'Holocene Variation of Monsoon Rainfall in Rajasthan', *Quaternary Research*, 16, 1981 pp. 135-45.

³⁷ A. Ghosh, *Op. cit.*

³⁸ R.N. Ghosh, 'Photo-geological studies on ancient water regimes of Rajasthan Rivers' in D.P. Agarwal and B.M. Pande (eds.), *Ecology and Archaeology of Western India* (Delhi, 1977) pp. 157-166.

³⁹ R.L. Raikes and R.H. Dyson, 'The Prehistoric Climate of Baluchistan and the Indus Valley', *American Anthropologist*, Vol. 63 (2); Pt.I, 1961, pp. 265-81.

⁴⁰ W.A. Fairservice Jr., *The Origin, Character and Decline of an Early Civilization*, American Museum of Natural History, No. 2302, 20 October, 1967.

⁴¹ Raymond and Bridget Allchins, *The Rise of Civilization in India and Pakistan* (New Delhi, 1983).

⁴² B.K. Thapar, 'Climate during the period of the Indus Civilization; Evidence from Kalibangan' in D.P. Agrawal and B.M. Pande (eds.), *Ecology and Archaeology in Western India* (New Delhi, 1977), pp. 67-71.

⁴³ L.S. Leshnik, 'Land use and ecological factors in prehistoric northwest India', in *South Asian Archaeology* (London 1973).

⁴⁴ V.M. Meher Homji, 'The Thar Desert : Its Climatic History', *Man and Environment*, Vol. IV (Ahmedabad, 1980), pp. 1-7.

⁴⁵ M.A. Courty and N. Fedorff, 'Micromorphology of recent and buried soils in a semi-arid region of North-western India', *Geoderma*, Vol. 35, 1985, pp. 285-332.

⁴⁶ M.A. Courty, *Le Milieu Physique et Utilisations due Sol. Prospections archéologiques au nord-ouest de L'Inde. Rapport préliminaire 1983-84—MAFI—Sous la direction d' Henri-Paul Francfort*, Editions *Recherche Sur les Civilisations* - Memoire No. 62, 1985, pp. 1-31; 'Integration of Sediment and Soil Information in the Reconstruction of Protohistoric and Landscapes of the Ghaggar Plain (North-West India)', *South Asian Archaeology* 1985. (Ed) Karen Frifelt and Per Sorensen. 1989, pp.255-59.

⁴⁷ F.A. Durrani, 'Climate of the Lower Indus Valley in Ancient Times', *Journal of the University of Peshawar*, Vol. 10, 1965, pp. 33-37.

According to the third school of thought, the Sarasvati became perennial or dry under the influence of the Yamuna or the Sutlej. While Oldham,⁴⁸ Ghosh,⁴⁹ Agrawal,⁵⁰ Yash Pal⁵¹ *et.al.* Saffer,⁵² Mishra,⁵³ the last three fortifying their theory on the strength of the satellite imagery, believe that the Sutlej was flowing southward from near Ropar to meet the Sarasvati until it took a westerly course to capture or to be captured by the Beas. On the other hand Raikes,⁵⁴ and Suraj Bhan⁵⁵ opine that the Yamuna was contributing its water to Sarasvati before some tectonic movement left the region between the Yamuna and the Sutlej high and dry.

Courty⁵⁶ while working under the Indo-French Archaeological Expedition has made a detailed micromorphological study of sediments and soil deposited and developed in the Ghaggar plain since the protohistoric period. The study reveals that the Ghaggar system did not share the water of Yamuna since early Holocene and that the regular floods had stopped just before the protohistoric period. Further, it is emphasised that the large meandering rivers were not flowing any longer and climatic conditions remain semi-arid without much fluctuation.

Besides, there are scholars who maintain that the Sarasvati was once connected with the main water-regime of the higher Himalaya until a severe tectonic movement delinked it with the latter and made it dependent on feeble springs of the Siwalik foot-hills and the rainfall. This view is expressed by Bhardwaj⁵⁷ and many others who appear to be influenced by the eloquent description of the *Rigveda*.

⁴⁸ C.F. Oldham, 'Notes on the Lost River of the Indian Desert, *Journal of the Asiatic Society*, 1893, pp. 49-76.

⁴⁹ A. Ghosh, *Op. cit.*

⁵⁰ D.P. Agrawal and R.K. Sood, 'Ecological Factors and the Harappan Civilization,' in G.L. Possehl (ed) *Harappan Civilization : A New Perspective* (New Delhi 1982), pp. 223-237.

⁵¹ Yashpal, 'Remote Sensing of the 'lost' Sarasvati River', in B.B. Lal and S.P. Gupta (eds.) *Frontiers of the Indus Civilization* (New Delhi, 1989), pp. 491-97.

⁵² Jim G.Saffer, 'Cultural Development in Eastern Punjab' in Jerome Jacobson (ed) *Studies in the Archaeology of India and Pakistan* (New Delhi, 1986), pp. 195-235.

⁵³ V.N. Mishra 'Prehistory and Palaeo-environment of Rajasthan' in D.P. Agrawal and B.M. Pande (eds.), *Ecology in Archaeology of Western India* (New Delhi, 1977) pp. 31-24.

⁵⁴ R.L. Raikes, 'The End of the Ancient Cities of the Indus,' *American Anthropologist*, Vol. 66 (2), 1964, pp.284-299.

⁵⁵ Suraj Bhan, 'Changes in the course of Yamuna and their Bearing on the Protohistoric cultures of Haryana', in S.B. Deo (ed), *Archaeological Congress and Seminar* (Nagpur 1972), pp. 125-128.

⁵⁶ Courty, *Op. cit.*

⁵⁷ O.P. Bhardwaj, *Studies in the Historical Geography of Ancient India* (New Delhi, 1986), pp. 8-19.

CHAPTER III

SUMMARY OF RESULTS

Jagat Pati Joshi

CHAPTER III

SUMMARY OF RESULTS

The horizontal excavation at Bhagwanpura, District Kurukshetra revealed a two fold culture-sequence designated as Sub-period IA and IB within a maximum culture deposit of 3.20 m showing for the first time that the late Harappan culture was interlocked with Painted Grey Ware culture in the later period of the occupation of the mound.

SUB-PERIOD IA

In Sub-period IA, the late Harappans on their arrival, raised mud platforms in two successive phases to get higher area which was safe against the flood waters of Sarasvati. It is interesting to note that besides the continuance of some of the Harappan forms and designs in pottery, the typical traditional concept of mud platforms, a Harappan legacy in construction technique for a small or big settlement, also continued at Bhagwanpura during the late Harappan times. On such platform measuring 4.25×10 m could be exposed in one of the trenches. The platform has a landing step too. After an accumulation of the deposit of 0.70-0.80 m the late Harappan occupation was ravaged by a gigantic flood, which was recorded in most of the excavated trenches. In spite of the destruction by the flood the Late Harappan people continued to live at the site (Flood I).

Pottery

The pottery of Sub-period IA generally falls in six broad groups: (i) the major pottery is red ware of late Harappan type which is well-levigated and fired. It is plain and painted. (ii) An ochre colour ware available from the trenches which are having flood effected horizon. (iii) A red ware similar to Cemetery 'H' type. (iv) An incised ware having a variety of designs some which have pre-Harappan lineage. (v) A thick grey ware generally associated with Harappan and the late Harappan assemblages. (vi) A pottery of Bara type, plain and painted incised.

In the red ware group, the shapes are comparable to late Harappan ceramic types available at Bara, Bahadarabad, Atranjikhara, Siswal IIB, Mitathal IIB, Daulatpur and Raja Karan-ka-Qila. The shapes include dish-on-stand, bowls, dishes, storage jars, jars with everted and flanged necks, basins, and button based goblets. No beakers are available. The non-availability of beaker is of considerable significance in the devolution of Harappan pottery types as such. The design repertoire includes thick and thin horizontal bands, criss-cross patterns, filled-in triangles, rows of opposite triangles, hatched triangles, arches with obliquely filled lines, leaves, banana tree and *pipal* leaf. The designs in the red ware included wavy lines, criss-cross patterns, horizontal lines divided by vertical lines and running triangles. The technique in incised red ware is reminiscent of fabric D of Pre-Harappan Kalibangan, Bara and late Harappa ceramic industries. At Daulatpur also we find this ceramic tradition. The shapes

in red ware are mostly jars and basins¹.

Antiquities

From levels of Sub-period IA, a red terracotta figurine of a bull with long horns and pinched up hump and grey to black terracotta fragment of a figurine showing leg portion of a human figure or deity and three terracotta anthropomorphic figures are remarkable. Terracotta wheels with hubs, copper rods and pins, beads of faience, semiprecious stones and terracotta, bangles of faience and terracotta, pins of bone are other interesting objects of the Sub-period. A humped bull shaped pendant of carnelian, although found from surface is one of the finest specimens and is reminiscent of the Harappan tradition.

SUB-PERIOD IB

Stratigraphically speaking, there is no break between Sub-period IA and IB. It is rather marked by the continuous occupation of the late Harappan and the arrival of Painted Grey Ware using people. However, there are two layers which overlap with the late Harappan pottery and yield thick Grey Ware. This is a significant aspect. After a deposit of 0.15 - 0.20 m which has yielded both the above ceramics, the occupation was damaged by a flood (Flood II) which washed away a major portion of the habitation. This appears to be a calamity of some magnitude. But as usual, the site was not deserted and it was reoccupied immediately after the devastating flood by both Late Harappan and Painted Grey Ware using folks. The statistical analysis of the pottery bears testimony to the fact that though the late Harappans continued to stay there, there has been a slow and gradual decline of their pottery specially in the late levels of the Sub-period IB. Does this indicate the increase in the Painted Grey Ware people, their stability or hegemony? This overlap of cultures is interesting. However, the co-existence of two different social groups at Bhagwanpura tend to bridge the gap.

Structures

The excavations at Bhagwanpura have revealed for first time some important evidence on the house types associated within Sub-period IB which has revealed three phases of structural activity. At first the people were living in round or semi-circular thatched huts or huts of wattle and daub. In an area of 4.25 × 6.85 m, twenty three post-holes in a trench have been found conforming a round or a semi-circular hut. Inside the hut, on the floor, the find of four saddle querns and different types of pestles, perhaps indicate that the house belonged to a corn grinder(?).

In the second structural phase a complete mud walled house complex in a trench having 0.70 - 1 m. thick walls have been found. This appears to be a well-planned house having thirteen rooms with a corridor in between two sets of rooms and a courtyard on the eastern side. The size of the rooms is

¹ We may refer here the late Harappan traits enumerated by K.N. Dikshit, 'Late Harappan Culture - A Reappraisal' *Archaeological Perspectives of India since Independence*, Delhi, 1985, p. 58-61.

SUMMARY OF RESULTS

from 1.60 × 1.60 to 3.35 x 4.20 m. From these rooms besides copper objects, faience bangles and beads, terracotta *ghata* shaped beads, bone styli, terracotta figures, Painted Grey Ware vessels and plain grey ware vessels and late Harappan pottery have been found. A statistical analysis revealed 2% to 5% of the late Harappan element in the pottery from inside the rooms of the houses showing some sort of socio-economic contact with the neighbouring late Harappans.

One oval shaped structure is associated with this phase. The structure has burnt earth and a few pieces of red ware including a dish-on-stand, uncharred bones besides terracotta fragments of its domical roof and a fragment of animal terracotta figurine. An indeterminate terracotta object has been found from the working level of one of these structures. It appears that these oval structures had probably a domical roof. In the absence of find of any metal and charcoal, these structures may have some religious significance. Similar structures with more or less identical contents have been available in the third phase also.

In the third structural phase, the houses are built of baked bricks. Due to vigorous ploughing activity all the structures have vanished leaving only scattered bricks.

Five oval shaped structures are associated with this phase. It appears that the constructions of such oval structures came into vogue in second structural phase and became very popular in the third structural phase.

Burials

Two skeletons have been found from the habitation area of Sub-period IB. Both the skeletons were found lying in north-south orientation with head towards the north and face tilted towards the west. A field study indicated that one of the skeletons belonged to an adult of advanced age and the other was that of a child of eight to ten years of age. While in the case of the adult, a grave pit line was available but no such pit line was traceable in the case of the infant. Surprisingly, the graves were devoid of any grave-goods. Though the orientation conforms to Harappan tradition, the absence of grave goods is noteworthy. However, the placement of the burial very near to the habitation is a complete departure from the Harappan tradition².

Pottery

Besides the continuance of the late Harappan pottery and antiquities, Sub-Period IB yielded thick grey ware, Painted Grey Ware, grey ware, associated red ware and a limited quantity of black ware. It may be noted here that layers (7) and (8) have yielded only thick Grey Ware without Painted Grey Ware. The design-repertoire of PGW is very rich in painted tradition. It includes dots, slashes, sigmas, horizontal bands, wavy lines, concentric circles, intersecting circles, net designs, honeycomb designs, fish scales, lotus, etc. For the first time a maltese cross and intersecting circles giving rise to six or four petalled flower have come to notice. There are ample sherds to show that first the outline of the design

² Based on the study made by Shri A.K. Sharma.

was drawn and later on filled with black pigment. Generally, the shapes in the Painted Grey Ware consist of bowls, dishes and straight sided bowls. For the first time it has been noticed that a few late Harappan shapes like bowls, basins, dishes, jars and dish-on-stand have been copied in the grey ware showing late Harappan influence. This further attests the intermingling in the potters craft.

Antiquities

Other important finds of this Sub-period include some terracotta anthropomorphic figures, having parallels with similar objects found in the Gandhara Grave Culture I in Pakistan³, one wheeled anthropomorphic figure, wheeled terracotta incised rams, bird, dogs, cart-wheels with or without hubs, hopscotchs, decorated dishes, ear-ornaments, dabbers with engraved marks akin to plus and minus marks; violin shaped mother goddess (?), used as pendants made out of grey pottery and ivory and bone needles, pins and styli, one stylus with black pigment on its tip probably a pen. Some of the bone pins have a very fine polish. Glass bangles in sea blue, white and black colour are most impressive finds and appears to be datable to at least *circa* 1400 B.C. Copper bangles, antimony rods, and some indeterminate pieces have also been found. A large number of terracotta *ghata* shaped beads so typical of Painted Grey Ware levels at other sites, incised biconical beads, decorated beads, of faience and semiprecious stone deserve special mention. Terracotta lamps, which have been discovered in the course of excavation might have been used for lighting the houses.

Animal Bones

A good quantity of animal bones have been found from the different levels. The assemblage consists of a large number of charred bones particularly belonging to that of cattle. Field observation shows that cattle, sheep, goat, ram, pig, dog and *equus* bones are present in the assemblage. Cattle bones from the lower levels are mostly of massive size. Few of the cattle bones show incomplete ossification. Charred tortoise shells are also present. The noteworthy bones are those of *equus caballus* Linn. from the levels of Sub-period IB. Cattle outnumbered other species. Sheep and goat were reared for wool. The people were generally vegetarian. The foregoing evidence available from the explorations and excavations suggests the following:—

1. Excavations at Manda, Akhnoor, in Sub-period IB, yielded the evidence of overlap of Grey Ware and late Harappan red ware. This grey ware is generally associated with Painted Grey Ware at other sites. The shapes are limited to bowls and dishes. A thicker variety of burnished grey ware in small quantity is also available prior to the appearance of Painted Grey Ware. The incidence of grey ware is 7% to 19% in the assemblage. No sherd of Painted Grey Ware as such is available.

Explorations in District Gurdaspur suggested that there are a number of sites with grey ware, black ware and late Harappan ware, but no site yielding Painted Grey Ware as such has been available in our explorations. This leads to the postulation that there might be a stage when the folks were using only plain grey ware. Statistical analysis of the Painted Grey Ware from the excavated sites in Punjab and Haryana has also clearly suggested that in the earliest levels the ratio of Painted Grey Ware and grey

³ A.H. Dani, *Ancient Pakistan* (Peshawar, 1968), Pls. II and III.

SUMMARY OF RESULTS

ware is 3:27⁴. Under the circumstances, presently, it appears that north of Amritsar to Manda only Grey Ware is found and Painted Grey Ware along with Grey Ware and Late Harappan Ware occurs in substantial quantity in district Amritsar, Ferozpur, Jalandhar, Ludhiana, Ambala and Kurukshetra.

2. While at Bhagwanpura, District Kurukshetra and Dadheri, District Ludhiana, there is a distinct period of late Harappan culture, at Nagar and Katpalon in District Jalandhar only the overlap phase is available. This amounts to show that on the east of Sutlej, the late Harappans came earlier and on the west of Sutlej they had only an interlocking with the Painted Grey Ware culture without having an independent earlier existence. In the Jammu region only the grey ware associated with Painted Grey Ware is available in the overlap period preceded by a Harappan occupation.

3. No iron is associated at any of these excavated sites during the overlap period.

4. Copper appears to be the only metal in use.

5. Bhagwanpura evidence suggests that wheeled terracotta and faience objects were the late Harappan contributions in the late Harappan-Painted Grey Ware overlap period.

6. The oval structures found at excavations at Bhagwanpura, Dadheri, Nagar and Katpalon perhaps indicate some religious use.

7. Glass appears to be a product of the Painted Grey Ware culture which appears in the overlap period. This is the period when perhaps technological development from faience to glass took place.

8. There appears to be an evolution of building methods from semi-circular huts to mud walled houses and finally to brick built houses in Sub-period IB. This evidence is recorded both at Bhagwanpura and also at Dadheri excavations.

9. In the Sub-period IB, i.e. late Harappan—Painted Grey Ware culture, the orientation of burials remained north-south but without any grave goods and located in the habitation area. The morphometric analysis of the human skeletal remains reveal similarity to broad general category of the Mediterraneans (See p. 163).

10. Typical button based goblets are available. Perforated jar is available in Period IB.

11. Painted Grey Ware design repertoire is influenced by late Harappan contact, particularly the emergence of geometrical patterns in the Painted Grey Ware at Bhagwanpura (See fig. 31).

12. The forms in pottery i.e. dish-on-stand, jars, etc. in grey ware have late Harappan influence (See fig. 28).

13. At Dadheri, the incidence of black ware is much more than its association in the similar context at Bhagwanpura.

14. Black and Red ware is available at Nagar and Katpalon in the earliest period. Bhagwanpura and Dadheri has a total absence of black and red ware.

15. The graffiti has a Harappan hang over in the yawning gap.

16. On the basis of T.L. dates, a date of *circa* 1700 to 1300 B.C. or even later to Sub-period IA with a margin at the lower end and to Sub-period IB a date of *circa* 1400 to 1000 B.C. has been assigned.

17. Evidence of two floods i.e., one in Sub-period IA and another in IB has been an interesting aspect particularly when *Satpatha Brahmana* also mentions two floods.

⁴ Detailed statistical analysis from various levels of excavations at Bhagwanpura, Dadheri, Katpalon, Nagar and Manda has been done by Miss Madhu Bala.

CHAPTER IV
CHRONOLOGY

Jagat Pati Joshi

CHAPTER IV

CHRONOLOGY

An analysis of pottery from Sub-period IA indicates that : (1) there is a Red Ware both plain and painted, (2) an ochre-colour ware is present but comes mostly from the flood affected trenches, (3) there is an incised ware with a variety of designs, some of it having a pre-Harappan lineage, (4) pottery of Bara type is present, (5) thick Grey Ware, generally associated with Harappan and late Harappan assemblages is present, and (6) there are some pottery shapes of Cemetery H. Generally in this amalgam of pottery, shapes include dish-on-stand, bowls, dishes, jars with everted rims, high neck jars, basins, drooping dishes of dish-on-stand and button-based goblets and cups. Besides, the usual geometric and vegetal designs are painted on the pots. The entire pottery corpus appears to be an amalgam of various ceramic traditions. For example, one can compare the shapes with Bara, Bahadarabad, Atranjikhara, Hulas, Siswal IIB, Daulatpur, Raja Karan-ka-Qila and Sanghol.

The antiquities of this Sub-period include a terracotta bull with long horns and pinched up hump, a grey to black terracotta consisting of the leg portion of a deity (?) or a human figure, and three anthropomorphic figurines, wheels with hubs, bangles, copper rods and pins, faience beads and bangles, beads of semiprecious stone and bone pins, etc.

Though no stratigraphic break could be discerned, the Sub-period IB is marked by the continuous occupation of the Late Harappans and the arrival of plain Grey Ware using people followed by the Painted Grey Ware folks. After an accumulation of this overlap culture, some of the habitation was washed away by a flood. This calamity did not prevent both the Late Harappans and the Painted Grey Ware using folks from continuing to live at the site. However, it has been noted that the Late Harappans gradually diminished; but they did not vanish till the end. This may be due to the superiority of the Painted Grey Ware people who slowly entrenched themselves at the site. During this period of overlap three phases of structural activity could be identified.

Digging in small scale was also carried out at Manda and Akhnoor in District Jammu; Nagar and Katpalon in District Jalandhar; and Dadheri, District Ludhiana. These small scale excavations have given important evidence in understanding the problem of overlap of late Harappan Culture with Painted Grey Ware Culture in the area and hence it may be desirable to discuss the same here.

No material for absolute dating is available at Manda; however, on the basis of Pre-Harappan Wares, the beginning of Sub-period IA can be dated to slightly earlier than about 2350 B.C. and the end at *circa* 1750 B.C. The spiral-headed pin suggests a date of *circa* 2100 B.C. for the middle levels of Sub-period IA. The beginning of Sub-period IB is then a little earlier than the middle of the second millennium B.C. Manda Sub-period IB anticipates an overlap of Grey Ware with late Harappan Wares. This compares well with Bhagwanpura IB late levels where only Grey Ware has been found. TL dates from Bhagwanpura may support the view. However, it must be borne in mind that Manda did not have a Bara or Cemetery 'H' element, whereas it is found with the Grey Ware at Bhagwanpura IB.

In the broad chronological context what is the position of Bhagwanpura? It has been summed up very lucidly by B.B. Lal, who visited the site and had detailed discussions with the author. He says, "But

then did the West and East, standing as already mentioned for the Indus and Ganges Civilization respectively, never meet? The answer would be : As mature they never met. But there did exist and meeting point between the two. This was at a time when the Indus had completely lost its urban character and had been diluted, with the amalgamation of other cousin cultures, to a stage almost beyond recognition and the Ganges Civilization was only in its infancy, much before it acquired its urbanism. This meeting is typified at sites like Bhagwanpura, Dadheri, etc. recently excavated by J.P.Joshi (1978). Bhagwanpura, Period IA yielded a few pottery types which had a Harappan affiliation, (e.g., the goblet) but most others were either only remotely derivable from the Harappan complex, or were influenced by the pre-Harappan Culture. Indeed, even in this region the pre-Harappan formed the base on which the Mature appeared like bubbles on a vast lake, only to disappear and merge into the waters of the lake itself. To quote Joshi: The pottery of this Sub-period (IA) is comparable to late Harappan ceramic types available at Bara, Bahadarabad, Atranjikhhera, Siswal IB, Mitathal I, IB, Daultpur and Raja Karan Ka Qila. Goblets are available but no beakers or perforated jars are found. (*During the course of further study and scrutiny of pottery perforated jars were found*). Painted and incised pottery is also available. The technique in incised red ware is reminiscent of fabric 'D' of Kalibangan pre-Harappan ceramic industry. Pottery with Harappan graffiti marks is yet another find (Joshi 1978: 98).

I have some reservations about the use of the term "Late Harappan", for the pottery from either Bahadarabad or Atranjikhhera. Neither ceramic corpus could be called "Late Harappan", since this term would apply only to the stage ensuing immediately from the Mature Harappan. Anyway, as a whole the pottery of Bhagwanpura IA is an amalgam in which trends derivable from various sources can be discerned.

While one may also take note of the "Harappan graffiti" from this Sub-period, let it be added that it is of such a kind that it does not establish the regular use of a script. At the most it implies a "hangover" of some symbols. But the more important point is the total absence of seals and sealings. Likewise, there are no weights or measures, nor are there the typical Harappan bricks, much less town planning. The faience beads and bangles do, of course, remind one of a Harappan survival. However, the point to be emphasised is that the Bhagwanpura culture complex, composed of what can be termed an amalgam of the nth generation of Harappan; the n+1th generation of Pre-Harappan and the yth generation of Harappan cousins, was in no way urban. It was in this essentially rural setting that the meeting with the PGW culture took place, the period of overlap being termed IB at Bhagwanpura, and likewise at Dadheri.

In this context one point deserves to be highlighted: Whereas the PGW culture, at sites like Hastinapura, Atranjikhhera, etc. is known to be associated with iron, that at Bhagwanpura and Dadheri has been reported to be without the metal, although objects of copper were only found (Joshi: 1978: 98-100). This would place the PGW Culture at the latter sites at a stage earlier than that at Hastinapura, Atranjikhhera, etc. This would also explain why there was no overlap between the late Harappan culture and the PGW Culture at, for example, Alamgirpur or Hulas.

To elucidate, the late Harappan Culture at Alamgirpur was earlier than the IA Culture of Bhagwanpura and the PGW Culture at the former site was later than the PGW Culture met with in Sub-period IB of Bhagwanpura. Thus, while there remained a gap at Alamgirpur, the same was bridged at Bhagwanpura.

Another aspect of this “standing apart” in the former case and the “shaking of hands” in the latter may now be emphasised. Since the meeting did not take place at the time of Indus urbanism, the same was lost forever. But, as the co-mingling took place at a time when there was a relapse into the rural stage, the rural traits of the Harappa Culture, and of its ancestor and cousins, survived. This is seen for example, in the criss-cross ploughing pattern of the fields, and tandurs of the Pre-Harappan levels at Kalibangan (Lal: 1971 and 1979).¹

There are no carbon date available from Bhagwanpura. 18 samples for TL dating were collected and were analysed by Dr. K.S.V. Nambi², Dr. R. Sasidharan and Dr. S.D. Soman of the Health Physics Division, Bhaba Atomic Research Center, Bombay, out of which six have been rejected. From the TL dates it appears that it will be plausible to give a date of *circa* 1700 to 1300 B.C. or even later to Sub-period IA with a margin at the lower end and to Period IB a date of *circa* 1400 B.C. to 1000 B.C. or a little earlier could be given³. In this connection a reference could also be made to TL dates from Atranjikhhera⁴, Lal Qila, Jhinhina and Nasirpur where the time bracket as postulated by R.C. Gaur is 2070-1340 B.C. in case one likes to give credence to the Ochre Colour pottery found at Bhagwanpura. Dr. Y.D. Sharma has suggested that on the basis of pottery, associated finds and absolute dating from Bara and Bara levels from Banawali, two phases of Bara culture may be ascribed i.e., earlier phase to *circa* 2000-1400 B.C. and *circa* 1460-1200 B.C. to late culture⁵.

At Bhagwanpura and Dadheri, the Late Harappan sub-period is immediately followed by an overlap sub-period with Late Harappan Red Ware, Grey and Painted Grey Ware. But in Sub-period IB at Manda, the Mature Harappan period is immediately followed by the overlap of late Harappan ware and Grey Ware. By way of the correlation, it appears that the earlier two layers of Sub-period IB of Bhagwanpura are equivalent to Sub-period IB at Manda. At both the places Black ware is also available.

The Bara and Cemetery H elements which are available at Bhagwanpura and Dadheri are absent at Manda in Sub-period IB. This may indicate that the intermingling of these elements or survivals, with the Late Harappans took place only in the Punjab and Haryana and not in the Jammu area. If this is true, it is a significant fact since it shows that Manda was beyond the influence of the Barans as such.

Another interesting feature which has come to light in Sub-period IB at Manda is the presence of two traditions of Grey Ware : (1) Grey Ware generally associated with Painted Grey Ware in Punjab and Haryana, and (2) Burnished thick Grey Ware. These wares are associated with Late Harappan Pottery but without goblets, beakers and terracotta cakes. At this point the evidence from Bhagwanpura IB is significant. Here a plain Grey Ware precedes by two layers the Painted Grey Ware which is associated with Late Harappan Ware. At bhagwanpura burnished Thick Grey Ware is not present. Thus, it appears that the Late Harappans came into contact with a Grey Ware using people in the first instance and then with Painted Grey Ware people. The time lag is not much but is meaningful.

¹ B.B. Lal, ‘Bhagwanpura as a Bridge between the Indus and Ganges Civilizations’ in G.L. Possehl (ed.), *Harappan Civilization* (New Delhi), pp. 337-338.

² K.S.V. Nambi, R. Sasidharan and S.D. Soman, *TL Dates from Bhagwanpura*, see p.185-204.

³ B.K. Thapar, *Recent Archaeological Discoveries in India*, UNESCO (Tokyo, Japan, 1985), see p. 68.

⁴ R.C. Gaur, *Excavations at Atranjikhhera, Early Civilization of the Upper Ganges* (Delhi 1983), pp. 20-23.

⁵ Y.D. Sharma and G.B. Sharma, ‘Bara Culture and its housing remains with special reference to Sanghol’ in R.K. Sharma (ed.) *Indian Archaeology—New Perspectives*, pp. 75-76; Madhu Bala, *Archaeology of Punjab*, (New Delhi, 1992), pp. 34-35.

On the basis of the finds at Manda Sub-period IB and Bhagwanpura Sub-period IB, it can be concluded that there was a phase of plain Grey Ware anterior to Painted Grey Ware. Both these Sub-periods have been found to be inter-locked individually or together, with the Late Harappan in Jammu, Punjab and Haryana. Since this picture is emerging in a region which is geographically well-known in the Vedic Period, it appears that one may be nearer to an identification of the culture with one of the waves of the Indo-Aryans. This is confirmed by both geography and chronology (i.e. during the middle of the second millennium B.C.).

In conclusion, it may perhaps be plausible to postulate that there has been an earlier stage of Painted Grey Ware Culture interlocked with the Late Harappan Culture which is pre-iron. Even in this stage itself we may now recognize a sub-phase of plain Grey Ware which may perhaps be anterior or contemporary with Painted Grey Ware. The second stage is well known with iron in the region and the Doab. In space we find Painted Grey Ware in District Amritsar and east of it. This is an important aspect for consideration in eastward movement. Besides it may also give some important clues for its distant connection with the western area beyond the present frontiers. So far identification of this culture with one of the waves of the Indo-Aryans speaking people is concerned, I may say, we have advanced a little and perhaps, now we are one step further and in a better position to assess the archaeological evidence with the literary data. In the present archaeological context it is tempting to quote F.R. Allchin⁶, "The arrival of the Rigvedic Aryan in the Punjab and Madhyadesha must have been in some ways different from the arrival of other groups elsewhere. For one thing it involved cultural contacts with the region in which the Indus urban tradition was best preserved and therefore in which germs of a new Indo-Aryan urban synthesis most likely to arise. For another it produced as a first fruit of that synthesis—the *Samhita* of the *Rigveda*. We would expect the initial composition of the early hymns to date from c. 1800-1500 B.C. The compilation of the *Samhita*, at least in its early form (i.e. excluding Mandalas I, VIII, IX, X) was made about that time as within next two or three centuries and the final additions were probably complete by 1000 B.C. Thus, we may regard the period from 1750 B.C. as early Vedic, the period from c. 1500-1300 B.C. as Vedic and succeeding as the late Vedic period"

⁶ F.R. Allchin, 'Archaeological and Language Historical Evidence for the movement of Indo-Aryan speaking peoples into India and Pakistan', *Journal of K.R. Cama Oriental Institute* (Bombay, 1980), p. 97; B.K. Thapar, "The Archaeological Remains of the Aryans in North Western India', Paper read at the Seminar on Ethnic Problems of the Early History of Central Asia and India in the Second Millennium B.C. Dushanbe, p. 12; Bridget and F.R. Allchin, *The Rise of Civilization in India and Pakistan*, pp. 305-308; Jagat Pati Joshi, 'The Mahabharata and Indian Archaeology' in B.M. Pande and B.D. Chattopadhyaya (ed.), *Archaeology and History*, p. 20 ff; R.S. Sharma, *Material Culture and Social Formation in Ancient India* (New Delhi, 1983), pp. 23, 27, 173; B.K. Thapar, 'The Aryans a reappraisal of the problem', Lokesh Chandra, S.P. Gupta, D. Swarup, S. Goel (ed.), in *India's Contribution to World Thought and Culture* (Madras, 1970), pp. 161 and 164; G.R. Sharma, 'Painted Grey Ware and Aryans', (Cyclostyled) Paper read in the Seminar on PGW at Aligarh 18-19th August, 1968; H.D. Sankalia, 'The Painted Grey Ware of the Gangetic Valley and Shahi Tump', (Cyclostyled) paper read in the Seminar on PGW at Aligarh 18-19th August, 1968; Asko Parpola, 'The coming of the Aryans to Iran and India and the cultural and ethnic identity of Dasas' *Studia Orientalia*, Vol. 64, pp. 195, 302 (Helsinki, 1988); Jagat Pati Joshi, Presidential address, Indian Archaeological Society, 24th Annual Conference Kanyakumari, *Facets of Indian History, Culture and Archaeology* (New Delhi, 1991), pp. XXIX-XXXI.

CHAPTER V

LIFE DURING THE PERIOD OF OVERLAP OF LATE HARAPPAN AND PAINTED GREY WARE CULTURES AT BHAGWANPURA

- A) Architecture**
- B) Food Habits**
- C) Domestication of Animals**
- D) Religion**
- E) Arts and Crafts**
- F) Society**

**Jagat Pati Joshi
and
Madhu Bala**

CHAPTER V

LIFE DURING THE PERIOD OF OVERLAP OF LATE HARAPPAN AND PAINTED GREY WARE CULTURES AT BHAGWANPURA¹

A. ARCHITECTURE

Excavations have revealed that in the first phase people lived in circular or semi-circular huts probably built of bamboo or wooden poles with thatched roofs. Huts consisted of four to five room which could easily accommodate seven to ten persons. The evidence of huts is available from Bhagwanpura (fig. 3).

In the second phase people started living in mud-walled houses. At Bhagwanpura, a large house built of mud-walls having thirteen rooms with a corridor at the centre and a courtyard to the east is a remarkable find. The size of rooms varied from 1.60×1.60 m to 3.35×4.20 m. The walls are 0.70 to 1.00 m thick and are made of hard fine alluvial silt. Keeping in view the large dimension of the house complex having a corridor and inter-communicating facilities, one may think of assigning the complex to a chief or to a large family. The courtyard to the east suggests that it might have been used by the occupant for sitting during the winter or summer and could command a view of the Sarasvati flowing nearby. No mud-bricks have been used which is a marked departure from the Harappan tradition. The house is well planned. There does not seem to be any evidence of bath-rooms or sanitary arrangement. It appears that this civil concept was forgotten and people used open air field for such purposes.

In the third phase, houses were built of baked bricks. Unfortunately no complete structure could be discerned at Bhagwanpura but the remains of bricks conform to five sizes: (1) $20 \times 12 \times 18$ cm; (2) $12 \times 12 \times 8$ cm; (3) $29 \times 22 \times 12\frac{1}{2}$ cm (wedge shaped); (4) $20 \times 20 \times 8$ cm and (5) $16 \times 12 \times 4$ cm. The bricks are well baked and have deep finger impression, which appears to be a characteristic feature. Due to vigorous ploughing activity at Bhagwanpura no complete structure of baked bricks could be obtained. The evidence of bricks is important. One is unable to understand why the Painted Grey Ware using people could not start living in brick houses right from the beginning of their arrival. The only answer appears to be that it took some time for these folks to learn the art of brick manufacture. May be, in the beginning, they were conservative in their way of living and did not imbibe the way of living of local inhabitants. It is only after considerable cultural inter-action that they took to brick manufacture and buildings.

B. FOOD HABITS

It appears that these people were mainly dependent on agricultural products. In one of the room of a hut, of this period at Bhagwanpura, four querns and pestles of different types were found besides few bones. It appears that it was a hut of a corn-grinder. Though no evidence of grains has been found

¹ J.P. Joshi and Madhu Bala, 'Life during the period of Late Harappan and PGW Cultures', *Journal of Indian Society of Oriental Art*, New Series, Vol. IX, pp. 20-29.



FIG 3: Painting showing life in successive Sub-periods

at Bhagwanpura, the evidence of grinding tools is an attestation to the fact that corn was ground and made into flour or paste. The different types of grains were ground in querns having various hardness. A.K. Sharma has pointed out that in Sub-period roasted meat of pig was eaten by some section of society.

A good quantity of animal bones has been found at Bhagwanpura. These include charred animal bone of cattle, sheep and goat which were perhaps eaten.

C. DOMESTICATION OF ANIMALS

Cattle, sheep and goat were domesticated, both for purposes of milk and meat. Remains of domesticated dog and pig at Bhagwanpura indicate its use as a pet. Horse and ass were known and were perhaps used as beasts of burden. The bones of horse form an important discovery. It appears that the animals were kept on stall feeding and show weaker and small sized breed. The wheeled terracottas and cart wheels do indicate the use of ram or bullock or horse cart.

D. RELIGION

Important light has been thrown on the religious life during the overlap period. Perhaps the oval structures having a domical roof and containing pottery and burnt earth might have had some religious association. It appears that these oval mud structures were first made and later on fired. These are available at Bhagwanpura. The availability of some uncharred bones suggest that some sacrifice might have been done therein. Very near to one of the oval structures at Bhagwanpura, an indeterminate terracotta object was found, which perhaps bespeaks some association with these structures. The presence of bones, dish and dish-on-stand, fragments of Painted Grey Ware suggests votive offerings.

Some violin-shaped mother goddesses carved out of grey ware sherds also indicate religious association. Three highly stylized anthropomorphic terracotta figures might also have some cult significance.

It appears that ram was a highly popular animal during this period. Many figures of rams are available. The availability of oval shaped fire altars (?) and rams of terracotta may indicate some association with Agni. It may not be out of place to mention here that similar rams and anthropomorphic figures are available from Gandhara Grave Culture I from Swat Valley in Pakistan.²

E. ARTS AND CRAFTS

The art of terracotta was highly developed. Rams on wheels decorated with incised oblique lines are fine examples of the plastic art of this period. Birds, dogs and bulls (rarely) were also made. The tradition of incised designs on animal and birds figures was a specific trait associated with the terracotta art of this period. Incised terracottas have been reported from the Painted Grey Ware levels at Alamgirpur and Mathura (U.P.). A ram's head is akin to a similar figure found at Balambhat in Gandhara

² A.H. Dani, *Ancient Pakistan* (Peshawar, 1968), pls. LI and LIII.

Grave Culture in Pakistan. The terracotta animal figurines of the overlap period are predominantly wheeled. Standing rams having incised group of horizontal and oblique lines on the body with perforation on the four legs for fastening the wheels are available. A hole runs through the nostrils for inserting a string for pulling the toy on wheels; a bird shaped rattle with incised decoration on the body; head of a spotted deer incised with circlets and a terracotta dog are some of the out-standing examples of terracotta plastic art.

(b) Ear ornaments and *ghata* shaped beads of terracotta were manufactured in substantial quantity.

(c) Bead making was a popular craft, as suggested by the find of some unfinished beads and raw material. Agate, carnelian, crystal, jasper and rarely lapis-lazuli were the popular stones on which beads were made. Different shapes in the beads show the aesthetic taste and professional technique of the craftsmen.

(d) Faience was a most popular material for manufacture of bangles and beads. Glass of blue, white and black colour was also used for making bangles. The glass has a clear and unmistakable conchoidal fracture. Fine examples of glass bangles are available from Bhagwanpura.

(e) Copper antimony rods and bangles show its use and possible manufacture also.

(f) Bone pins, needles and styli were made locally as both finished and unfinished specimens are available.

(g) The art of potter contributed significantly during this period. We find that the potter imbibed the decoration of geometric designs from the neighbouring late Harappans and also copied some of the shapes, e.g., jars, bowls and dish-on-stand in grey ware (see fig. 31).

Availability of dabbers shows local manufacture of pots and as usual the potter might have occupied an important place in the society. Bhagwanpura has yielded fine examples of Painted Grey Ware.

F. SOCIETY

It appears that the society consisted of agriculturists, potters, craftsmen, masons, corn grinders and traders and a few elite. The beads suggested that there was an economic class distinction. People in the early stages lived in huts and then in mud-walled houses and finally took to brick-built houses. The Painted Grey Ware using folks probably learnt the technique of making wheeled terracotta and geometric designs on pottery from the neighbouring late Harappans. It appears that during the period, the late Harappans and PGW folks lived together and the latter learnt from the former. In the houses of PGW using people 2 to 5% of late Harappan pottery indicates social contact. People used to bury their dead in graves. They might have adopted also other ways of the disposal of dead. Two skeletons have been found at Bhagwanpura, both showing north-south orientation with head towards the north and face tilted towards the west, in the habitation area. In one of the graves, a grave pit line could be traced. The graves were devoid of any grave goods and their location in the habitation area is a departure from the orthodox Harappan tradition.

The folks used to wear ornaments of terracotta and bangles of copper, shell, faience and glass. *Ghata*-beads and beads of semiprecious stones were also used. Hair-pins of bone and ivory, of which

LIFE DURING THE PERIOD OF OVERLAP OF LATE HARAPPAN AND PAINTED GREY WARE CULTURES

fine specimens were available from Bhagwanpura, were popular and ladies used these for ornamental hair styles. Skin rubbers were used for cleaning the body.

The availability of hopscotch and terracotta balls and toys from Bhagwanpura, point to popular games and pastimes of the children.

In conclusion, it may be said that the life of the people during the overlap period i.e. Sub-period IB, as evidenced by the available material remains, was simple, based on advanced pastoral economy.

CHAPTER VI
CUTTINGS

Jagat Pati Joshi

CHAPTER VI

CUTTINGS

Excavations at Bhagwanpura mound were undertaken in horizontal style of excavation technique. However, where no structures were found, vertical digging was done upto the natural soil to obtain a complete sequence of the site. The mound, as earlier mentioned, is heavily eroded. The intact portion was taken up and the area was divided into squares of 10×10 m. In all twelve trenches were undertaken for excavation which included the highest and lowest points of the mound (fig. 4). The trenches taken for excavations are as below :-

A 1, B 1, C 1, D 1,
ZA 1, ZB 1, ZC 1, ZD 1,
A 2, A 3, A 4, XB 2.

In brief, excavation in the mound taken as a whole has revealed that the mound at Bhagwanpura has a total maximum cultural deposit of 3-20 m having 8 to 13 layers with a cultural deposit 1.80-2.00 m of Sub-period IA and of 1.10-1.20 m of Sub-period IB. Natural soil has been touched in trench D 1, Qd. 2 and A 1, Qd. 1. In the entire deposit, it has been noticed that there has been continuity of habitation and the settlement suffered by two floods of river Sarasvati (pl. IV).

The earlier flood designated as Flood I as evidenced in trenched D 1, Qd. 2 is represented by flood deposits i.e. sand and silt in layer nos. 12 and 13 above the natural soil. Layer no. 13 has greenish alluvial soil and sand along with late Harappan pottery. Layer 12 has considerable amount of pottery of late Harappan assemblage. The *in situ* condition of pottery, sand and silt are clear indicative of flood activity. This Flood I occurred in Sub-period IA during the early days of the settlement.

The evidence of Flood II is available from Trench A 1, Qd. 2. In this quadrant, in the section looking north, it has been borne out by the flood scar sealed by layer 5 and cut into 6, 7, 8 and platform of Sub-period I upto the natural soil. This flood deposit has a maximum available width of 3.85 m in the trench. It has sand and silt and clay in it. It has yielded Painted Grey Ware and associated pottery in abundance alongwith the late Harappan pottery. Evidence of Flood II is also attested to in trench XB 2, where in the deposit is available below layer 5 and it could be available up to a depth of 40 cm.¹

For understanding the stratigraphy of the area the sections of the following trenches having most representative features, give a clear picture of the habitation and structural activity in the area :

A. SECTION LOOKING NORTH

(Trench A 1, Qd. 2; B 1, Qd. 1 and 2; C 1, Qd. 1 and 2; D 1, Qd. 1 and 2)

Trench A 1, Qd. 2 and B 1, Qd. 1 and 2 —These trenches have been taken at the highest available point of the mound.

¹ *Satapatha Brahmana* and *Puranas* refer to two floods. Madhu Bala, 'Floods' in A. Ghosh (ed.) *An Encyclopaedia of Indian Archaeology*, p. 202-203; Swami Vidyananad Saraswati, *Aryon Ka Adi Desha Aur Unki Sahyata* (in Hindi), Bombay, 1989, pp. 85-89.

In trench A 1, Qd. 2, B 1, Qd. 1 natural soil has been touched at a depth of 3·65 m. The northern side section has been exposed in A 1 and B 1 in silt of 1 m width.

Natural soil has been touched at a depth 3·45 m. Above it platforms I and II made of hard clay and earth have been found. Platform I has a thickness of 1·10 m and Platform II has a thickness of 1·20 m. While Platform I is made over the natural soil, platform II has been built over platform I (Both platforms are made in successive phases and platform II is sealed by layer no. 8).

Layer no. (8) consists of compact clayey earth having considerable late Harappan pottery in it. It has a thickness of 30 cm and is a universal layer. This area has given interesting evidence regarding floods and platforms. It appears that late Harappans, being aware of the constant damage, caused by the river Sarasvati on their first occupation of the site, built a platform of about a metre over the greenish pre-occupation deposit. The section facing south and facing west give evidence that over this platform another platform of hard clayey material was made. Both these platforms and the habitation was cut by a flood at the level of layer no. (5) which is represented by huge scar going down upto the depth of 3·20 m in the section looking north. Maximum width of the flood channel is 3·25 m. The flood material contains Painted Grey Ware and Late Harappan pottery. This flood deposit is designated as Flood II.

Layer no. (7) is a hard compact layer with considerable pottery and *Kankar* in it having a thickness of 15 cm.

Layer no. (6) which occur below layer no. (5) is quiet compact layer with hard earth and clay. It has a width of 15 cm. Layer no. (5) is a compact layer having earth and clayey patches in it with a width of about 15 cm.

Layer no. (4) is a fairly broad layer, compact in nature and clayey in material having a deposit of 30 cm. Layer no. (3) is a compact layer having a deposit of 15 to 20 cm.

Layer no. (2) having a deposit of about 20 cm brownish in colour consists of slightly loose earth.

Layer no. (1) consist of top humus and clayey loose material having a deposit of 15 cm.

Trench C 1, Qd. 1 and 2.—In this area digging was carried out to a depth of 2·50 m in C 1, Qd. 1. In both the trenches, remains of a platform with a thickness of 1 m is encountered. This Platform II is overlain with floor deposit of 10 cm having ash, pottery and clayey chunks. Layer (8) seals the floor and has thickness of 30 cm consisting of compact clay, bands and considerable pottery. It is a universal layer. Layer no. (7) having a thickness of 20 cm, has compact earth and pottery. Layer no. (6) is compact layer with earth having a thickness of 20 cm. Layer no. (5) is a loose earth having a thickness of 10 cm. Layer no. (4) consists of loose earth and clayey patches, having a thickness of 20 cm. Layer no. (3) having a width of 20 cm consists of compact earth. Layer no. (2) is slightly compact earth having clayey patches with a thickness of 30 cm. Layer no. (1) consists of top humus and loose earth having a deposit of 10 cm.

Baulk between B 1, Qd. 2 and C 1, Qd. 1.—During the course of baulk removal at a depth of 50 cm, another arm of the mud house complex, having a width of 1·10 m and the built over layer no. (5) and sealed by layer no. (3) has been exposed. The layer composition above the structure is similar to the adjacent trenches already described.

Trench C 1, Qd. 2.—In this trench digging has been done upto a depth of 2.50 m. Remains of Platform II have been available at a depth of 1.60 m. Layer no. (8) seals this platform which has a thickness of 20 cm. The layer no. (8), (7), (6) and (5) are extensions of the same descript layer found in C 1, Qd. 1. However, layer no. (5), having a thickness of 20 cm, is having loose earth and compact clay chunks. Over this layer two arms of a mud built house walls, admeasuring 1.20 m each are available and in layer no. (4B) is a floor of the house, (4A) and (4) are the contemporary deposits of the mud house. These layers have ash and considerable quantity of Painted Grey Ware and a few sherd having Late Harappan affinity. The layer no. (3) seals this structure. It is composed of compact soil having a thickness 25 cm. Layer no. (2) has hard clayey material having a thickness 2 cm. Layer no. (2) is the loose humus having a thickness of 10 cm.

Trench D 1, Qd. 1.—Digging has been carried out up to a depth of 50 cm and it has yielded a mud wall having a length of 5 m, sealed by layer no. (2), equated with layer no. (3) in the adjacent trench. In this trench layer no. (2) consists of clay and loose earth. It has a thickness of 20-10 cm. Layer (1) is humus and has a thickness of 10 cm.

Trench D 1, Qd. 2.—In this trench, situated on the eastern periphery of the mound, digging has been carried out up to a depth of 3.65 m and natural soil has been touched. Layer (13), having a width of 35 cm on this side of the section, has greenish compact sand and clay with potsherds. Layer (12), which occurs over it, is very thick layer and have chunks of compact earth, brick bats and profuse late Harappan pottery. The maximum thickness of the layer is 40-75 cm. It represent the deposit of Flood I. Layer (11) has yielded chunks of hard clay and a portion of the eroded Platform I. The width of this layer is 45 cm. Layer (10) consists of loose, earth, sand, ash, brick-bats and potsherd having thickness of 35 cm. Layer no. (9) consists of loose earth with some compact patches having a thickness of 20 cm. Layer no. (8) is composed of very compact earth. It has a thickness of 20-10 cm. Layer (7) consists of loose earth and potsherds. It has a thickness of 15 cm. Layer no. (6) is hard clayey layer, yellowish in colour, has a width of 10-20 cm. Layers no. (5) and (4) are successive floors having a thickness of 10 cm and 15 cm respectively and contain ash and clayey chunks. Layer no. (3) is mostly loose and has hard chunks spread over it. This layer has given considerable pottery. Layer (2) is a universal layer and has loose brownish patches. Layer no. (1) is a universal layer consisting of top humus and clay patches.

B. SECTION LOOKING WEST

(Trenches A4, Qd. 2; A3, Qd. 2 & 3; A2, Qd. 3 & 4; A1, Qd. 2 & 3)

Trench A 4, Qd. 2.—This trench lies on the tip of the mound towards south facing the onslaught of river Sarasvati. Digging has been done here upto a depth of 1 m at the higher level and 40 cm at the lower level, bringing out five layers. Layer no. (5) is the lowest layer exposed in this trench at a depth of 1 m. It consists of hard clayey compact material along with charcoal and pottery. It is a floor which is universally found in the trench having a thickness of 15 to 25 cm. Layer no. (4) which occurs over layer no. (5) has loose deposit of earth and small *kankar* stones. It has been disturbed by roots of trees.

It has an average thickness of 30 cm. Layer no. (3) having a thickness of 20 cm consists of loose earth. Layer no. (2) is a compact layer with patches of clay. It is a universal layer having a thickness of 20 cm. Overlying this is a layer no. (1) having thickness of 20 cm with top humus. The oval structure cuts into layer (3), (4) and (5) sealed by (1). It has yielded late Harappan pottery and Grey Ware.

Trench A 3, Qd. 3.—In this trench digging has been done up to a depth of 2.15 m thus exposing to view in the southern side remains of mud platforms with a width of 1.15 m having compact earth. This platform has been cut by Flood II yielding late Harappan and Painted Grey Ware pottery. Layer no. (5) is a floor of compact clay. In this layer at a depth of 80 cm below surface 21 post-holes have been found, which are the remains of a hut. It appears that it is a hut with an annexe. Inside the hut three saddle querns have been found in an upside position and the fourth one is in its usual position. One long pestle with round ends, another rectangular and two ovoid pestles have been found. The diameter of the post-holes varies from 10 to 15 cm. Near the saddle querns a big fragment of a jar has been found. Again jaw of a bovine has also been found on the floor of this hut. It appears that the hut might belong to a person who was grinding corns. Layer no. (4) which seals the floor of the hut has loose earth and compact hard clayey patches along with greenish patches having ash charcoal and pottery. It has thickness of 30 cm. Layer no. (2) consists of slightly compact earth with clay chunks having a thickness of 25 cm. Layer no. (1) consists of top humus and loose earth, having a deposit of 10 cm.

Trench A 2, Qd. 3 and 4.—Digging has been done to a depth of 1.75 m. In the lowest area of the trench remains of mud platforms having a thickness of 80 cm made of compact earth and clay have been exposed. This platform has also been cut by a pit sealed by Layer no. (5). Layer no. (6) is quite compact which is a floor level on which post-holes have been found in A 3, Qd. 2 which has already been described above. Layer no. (5) is about 25 cm and consists of hard clayey material. Layer no. (4) is again a compact layer with high quality clay material in it having 15 cm thickness. Layer no. (3) consists of clay and compact in nature having a thickness 10-15 cm. On this layer, an oval structure has been found in the north-western part of the trench. Layer no. (2) is contemporary deposit of the structure and it has been sealed by layer 1. It has got a maximum length of 1.80 m and a width of 85 cm. The wall of the structure is 10 cm wide. The maximum height of the structure is about 20 to 10 cm and it contained burnt earth and pottery. A few high necked jars of the Late Harappan fabric and a few Painted Grey Ware sherds have been found from the oval structures. Another remarkable feature of this layer is the find of a large number of pottery belonging to the Painted Grey Ware and associated Wares with bone pieces found on the northern side. Painted Grey Ware dishes, jars and basins with grooved rim are found. Quadrant 4 has yielded very good evidence of a accumulation of jars *in situ* and a dish on-stand. The accumulation is in two groups. One on the northern side and other towards the southern side. A piece of saddle-quern was also lying on the same level i.e. on the top of layer no. (3). A pestle was found lying in the southern side. Remains of an oven have been found (dimension 35 cm length 70 cm width).

Layer no. (2) consists of loose earth having a thickness of 30 cm. Layer no. (1) is a layer of loose humus having a thickness of 15 cm.

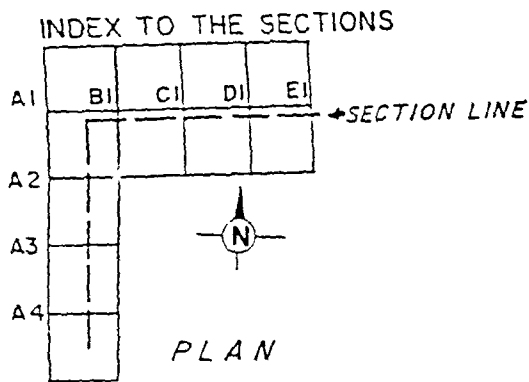
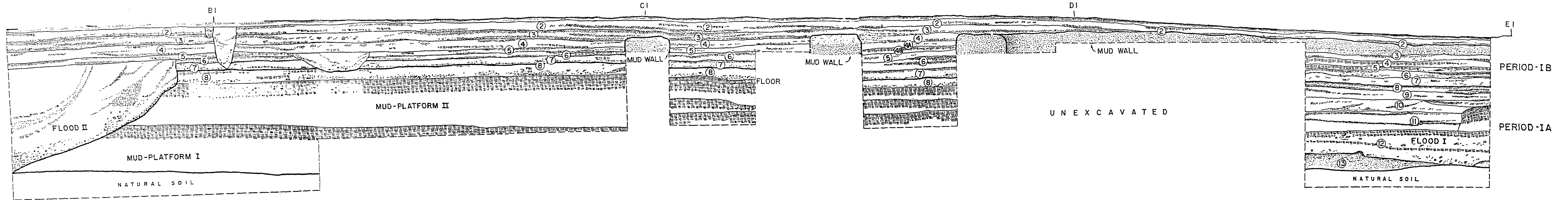
CUTTINGS

Trench A 1, Qd. 3.—In this area digging has been done to a depth of 70 cm. The lowest layer exposed is layer no. (3) consisting of clay and having compact in nature having a thickness of 30 cm. Layer no. (2) is loose layer having earth and brick-bats in abundance. It has a thickness of 25 cm. Over this, layer no. (1) lies which consists of loose humus soil having a thickness of 15 cm.

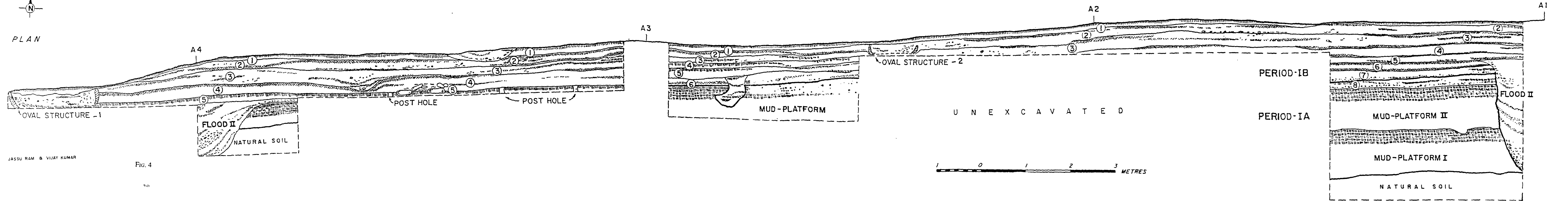
Trench A 1, Qd. 2.—In this quadrant digging has been carried out upto depth of 3·65 m and natural soil has been touched. In the section looking north, in the adjacent area i.e. trench A 1, Qd. 2 and B 1, Qd. 1 and 2 has been described above. However, in this section the flood scar continues and has cut the mud platforms. The available thickness of the successive mud platforms is 1·10 m and 1·20 respectively. Here the platforms are sealed by layer no. (7). Layer no. (8) consists of compact clayey earth having considerable late Harappans pottery in it. It has a thickness of 30 cm and is a universal layer. This has interesting evidence of flood scar in the north-western corner. In this section it has a width of 60 cm. This flood is designated as Flood II and has yielded Late Harappan and Painted Grey Ware pottery. Layer no. (7) is a hard compact layer with considerable pottery and kankar in it having a thickness of 15 cm. Layer No (6) which occurs below layer no. (5) is made of quite compact earth and is having a thickness of 15 cm. Layer no. (3) is a compact layer having a deposit 15-20 cm. Layer no. (2), having a deposit of about 20 cm, brownish in colours consist of slightly loose earth. Layer no. (1) consists of top humus and clayey loose material having a deposit of 15 cm.

BHAGWANPURA, 1975-76
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SECTION LOOKING NORTH



SECTION LOOKING WEST



JASSU RAM & VIJAY KUMAR

Fig. 4

0 1 2 3 METRES

CHAPTER VII

STRUCTURES

Jagat Pati Joshi

CHAPTER VII

STRUCTURES

The foregoing account of stratification brings out clearly the relative position of habitational activity at Bhagwanpura and accordingly, the various structures found in different levels, now need a periodwise detailed description to bring out their architectural and other features.

The structures available in the excavations at Bhagwanpura are as below.

Sub-period I A : Platforms

Sub-period I B :

- (1) Post holes—Huts
- (2) Mud walls—Thirteen roomed House
- (3) Bricks—Brick houses
- (4) Oval Structures

SUB-PERIOD I A : With a view to save the settlement from the onslaught of the floods of river Sarasvati, the late Harappans built a mud platform for their settlement at Bhagwanpura in two phases. Evidence of the platform is available in Trench no. A 1 and B 1 which has a thickness of 1·10 - 1·20 m respectively. In one trench i.e. B 1 the entire surface of the platform, was uncovered, after removal of layer (8) which has sealed it. The area of the platform thus uncovered is $4\cdot25 \times 10$ m which had also a landing step (pl. V). This structure has yielded Late Harappan pottery. These platforms were damaged by Flood II at a later stage. However, in Trench D 1, Qd. 2, Flood I damaged the platforms in the early stage of the habitation.

No other structural remain except the aforesaid platforms could be identified in the trenches. However, a few brick-bats do suggest the use of burnt bricks during this period. No mud bricks have been found.

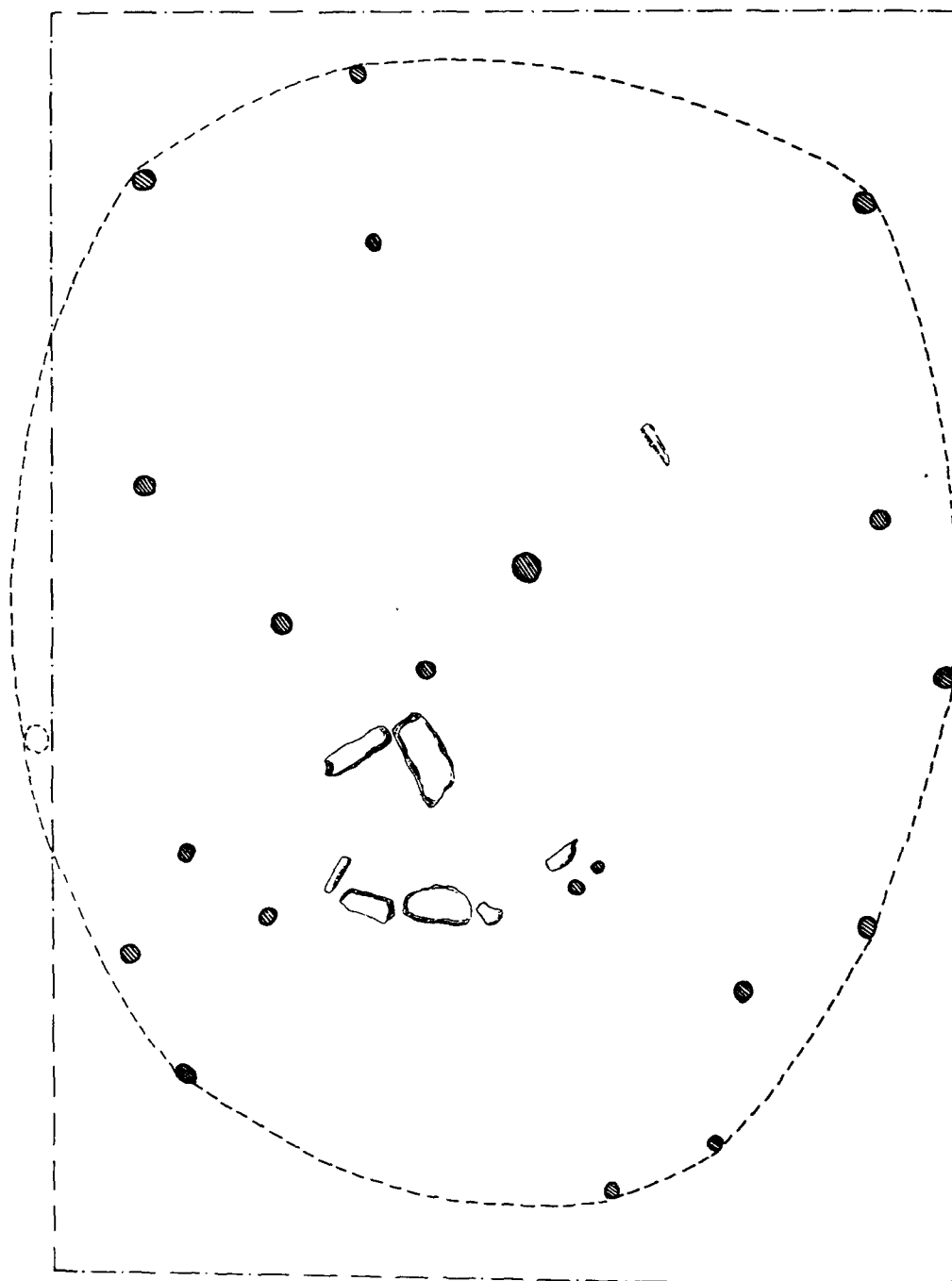
SUB-PERIOD I B : This Sub-period has a cultural deposit of 1·10 m-1·20 m. It appears that after the first occupation of the site having a deposit of 20 cm, the habitation was damaged by a massive flood which washed away the habitation from centre of the mound in south eastern side. In this area the deposit of Flood II is about 2·20 m. This flood was of considerable magnitude and washed away a major portion of the earliest occupation of the overlap period. After this flood, the site was immediately occupied. The site has yielded the evidence of structural activity during this Sub-period in three phases.

HUTS

PHASE I.—The earliest structural activity of Phase I consists of huts. This evidence is available in an area of $4\cdot25 \times 6\cdot85$ m at a depth of 70 cm in the south-eastern periphery of the mound in trench A 3, Qd. 2 and 3. This area has yielded the evidence of 23 post-holes in layer (5) which represents a floor.

PLAN OF CIRCULAR HUT AT BHAGWANPURA

1 0 1 2 METRES



VIJAY KUMAR

FIG. 5 : Plan of circular hut, Structural Phase-I (Trench A3, Qd. 2 and 3)

STRUCTURE

The post holes suggest that there was a circular hut having poles with an adjacent verandah or annexe on the floor of the hut. Four saddle querns and three pestles each having been found *in situ* along with a few fragments of a jar in red ware. Out of four querns, three querns have been found in up-side down position. Four pestles e.g. round, rectangular and long suggest use of grinding of different types of corns or some food materials (pl. VI; fig 5). In the verandah of the hut, jaw of a bovine was also found lying *in situ*. One of the post holes has also yielded some charred material. Keeping in view of the find of so many saddle querns and pestles in the hut, we may infer about its owner who had specialized in grinding the corns for the community. Generally in a house one grinding stone and pestle would suffice the needs of the house-hold, but find of so many gives a plausible explanation as above.

MUD WALLED HOUSE

PHASE II.—The second structural phase consist of a complex of mud-walled house. This complex has been found in trenches C 1, D 1, Z B 1, Z C 1, Z D 1, and in the north eastern side of the mound and consists of a row of rooms flanked on both the sides by a corridor (pl. VII). This house complex has been built over layer (5). Its contemporary deposit is layer no. (4) and it is sealed by layer no. (3). The length of the corridor is 14.35 m and width 2.20 m. The width of the wall flanking is one metre. Altogether 13 rooms, 5 rooms in the western side and 7 rooms on the eastern side, 1 room on the northern side of the corridor, have been found. The size of the rooms is from 1.60 × 1.60 m to 3.35 × 4.20 m. The rooms have yielded burnt walls of hearths and animal bones. The maximum extent height of the mud wall is 40 cm (fig. 6).

BRICK-HOUSES

PHASE III.—In phase III it appears that the houses were built of baked bricks. This evidence is available from trench A 1, Qd. 3, layer 2. Due to ploughing, much of the evidence of the burnt brick houses has been destroyed. However, the accumulation of burnt bricks found in different trenches suggest the existence of burnt brick structures (pl. VIII). One interesting feature of the burnt bricks of the Sub-period is the finger marks on the bricks running longitudinally. The bricks sizes (pl. IX) are 20 × 12 × 8 cm; 12 × 12 × 8 cm; 20 × 20 × 8 cm; 16 × 12 × 4 cm; 29 × 22 × 12½ cm (wedge-shaped).

Some wedge-shaped bricks have also been found. It appears that the north-eastern portion of the mound remained very much intact throughout the occupation of the overlap Sub-period.

OVAL STRUCTURES

Another interesting structures associated with the structural activity of the overlap Sub-period is the find of six oval structures.

• OVAL STR 1 : On the lower side of Trench A 4, Qd. 2, a large oval structure has been found built on layer no. (5), having layer no. (4) and (3) as its contemporary deposits sealed by layer no. (1). Here layer

PLAN OF THIRTEEN ROOMED HOUSE
AT BHAGWANPURA

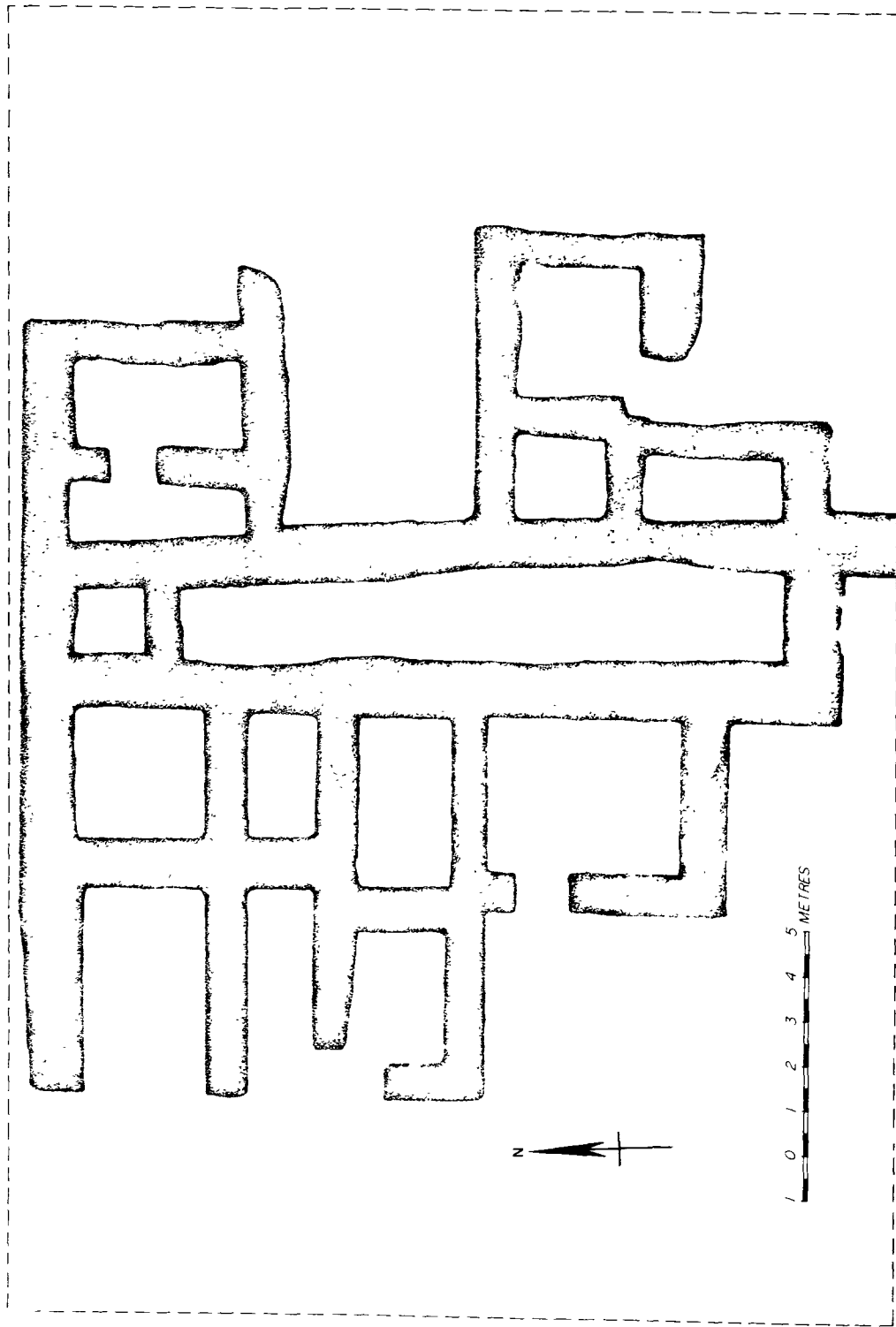


FIG. 6 : Plan of thirteen roomed house, Structural Phase-II (Trench C1, D1, ZB1, ZC1, and ZD1)

STRUCTURE

no. (2) is absent. This is an oval structure having a length of 1.80 m width 0.85 m. The thickness of the wall of the structure is 10 cm. It contained Late Harappan pottery, grey ware and loose earth (Phase III).

OVAL STR II : The oval structure is built on layer no. (3) and sealed by layer no. (1) in trench A 2, Qd. 1. The length of the structure is 1.55 m and width 65 cm. It contains Late Harappan pottery and Grey Ware (Phase III).

OVAL STR III : This structure is built over layer no. (3) and sealed by layer no. (1) in trench A 1, Qd. 2. The length of the structure 2.50 m containing pottery and brick-bats and lumps of terracotta having a depth of 1 m (Phase III).

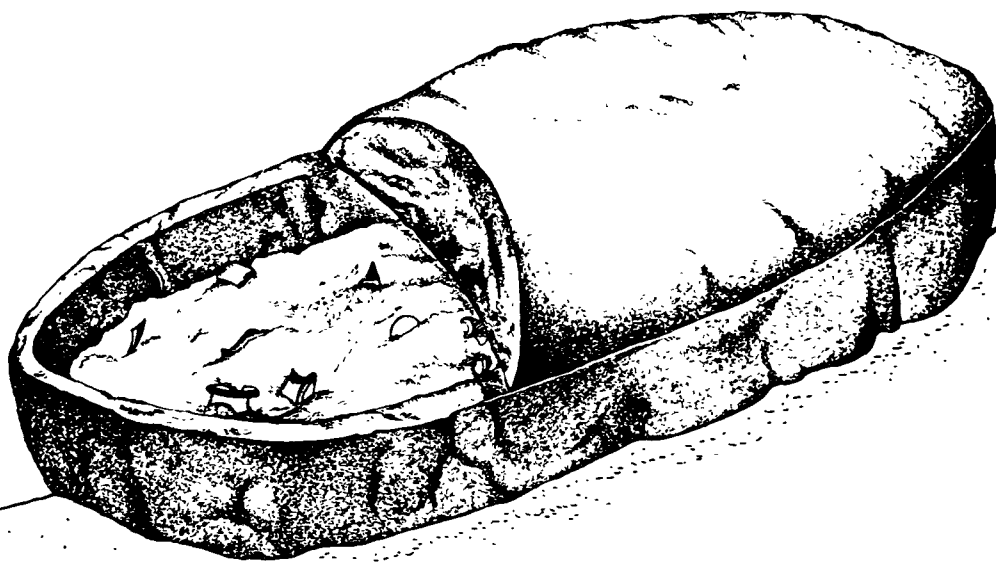
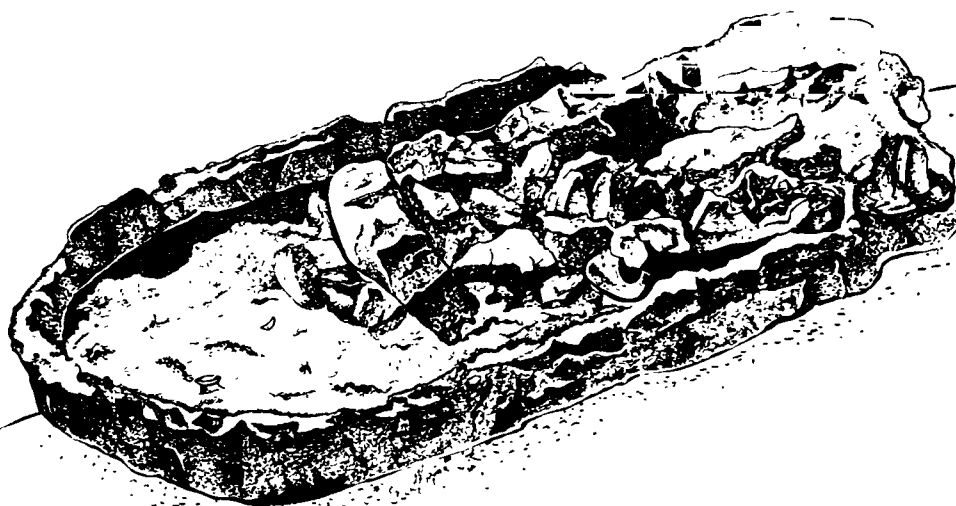
OVAL STR IV : This oval structure is situated in trench B 2, Qd. 4. It has a length of 2.50 m and width of 1.50 m. Thickness of wall is about 15 cm, built over layer no. (3) and sealed by layer no. (1). This oval structure appears to have been built in two phases (pl. X). In the later phase the oval structure has been found having a length of 1.75 m and width of 1 m. The thickness of the wall is 1 m (Phase III).

OVAL STR V : The oval structure, situated in trench A 4, Qd. 2, has a length of 2.80 and depth of 50 cm. It also contains brick-bats and pottery. It is available from the surface and cut into layer no. (1) and (2) (Phase III).

OVAL STR VI : This oval structure is situated in trench A 1, Qd. 2. It has yielded a dish-on-stand of the late Harappan variety. It is built on layer no. (6) and sealed by layer no. (3). The dimensions are 1.60 × 0.92 m. Again this has 5-10 cm thick highly burnt wall containing burnt earth pieces, portion of a collapsed domical shaped roof and a few potsherds, uncharred bones pieces fragment of a horn presumably of a terracotta animal figurine (Phase II). A cross section of the structure revealed that the structure consist of the burnt material up to a depth of 35 to 40 cm (pl. XI) and a few pieces of bones have been found without any burnt marks.

No metal has been found from all the above six oval structures. However, a fragmentary indeterminate terracotta was found from the working level of OVAL STR. VI. Generally the upper portion of the wall appears to be very much burnt and the lower portion consist of clay nodules. Inside the structure brick-bats, burnt earth with husk and reed marks have been found (pl. XII).

There does not seem to be much evidence supporting the hypothesis in calling these oval structures as kilns or furnaces. The find of fragments of Painted Grey Ware bowls and dishes, animal bones may perhaps suggest ritualistic use. The accumulation of burnt material does show some sort of a collapse of the domical roof of the structure, may be due to disuse (fig. 7).



Vijay Kumar

FIG. 7 : Conjectural elevation of an oval structure

CHAPTER VIII

THE POTTERY

Madhu Bala

CHAPTER VIII

THE POTTERY

The pottery from Bhagwanpura comprises of nine major groups each having its own diagnostic traits. In Sub-period IA, Late Harappan red-ware; red ware of Cemetery 'H' type; and red ware of Bara fabric are available. In Sub-period IB, all the above three fabrics continue while in layer nos. (7) and (8) a grey ware is available along with a coarse red ware. Painted Grey Ware is available from layer (6) to layer (1). Besides this, a few sherds of burnished grey ware have also been found in the early levels of Sub-period IB. In summary the main pottery groups are enumerated as below :

- (1) Late Harappan red ware
- (2) Red Ware similar to Cemetery 'H'
- (3) Red Ware of Bara type
- (4) Grey Ware
- (5) Burnished thick grey ware
- (6) Painted Grey Ware
- (7) Black Ware
- (8) Red ware, coarse in fabric associated with PGW
- (9) Hand made thick basket impressed grey ware

All these wares show similarity with the pottery of comparable period found at some of the excavated sites. The comparable shapes in pottery with other late Harappan and Bara sites are drooping dishes, high necked jars, squat dish-on-stand, cup-on-stand and lids etc.¹ It may be mentioned that red ware with incised designs of varied types has been found both in Sub-period IA and IB. The incised designs are comparable to Bara and Mahorana. The incidence of this fabric decreases in Sub-Period IB. It may be noted here that the incised designs have a pre-Harappan lineage.

¹ The sites are Ambkheri, Bahadarabad, Bara, Banawali III, Bargaon, Chandigarh, Daulatpur, Hulas, Mahorana, Mithathal. The late Harappan pottery from these sites (except Ambkheri) is not fully published. However, some comparisons could be made in the following publications; S.P. Gupta, *Puratattva*, No. 5, fig. 1-20; Y.D. Sharma, 'Fresh light on the Bara Culture from Mahorana' in B.M. Pande and B.D. Chattopadhyaya (ed.), *Archaeology and History* (Delhi 1987), pp. 157-176, figs. 5,6,7,8,9,10; Y.D. Sharma, 'Harappan Complex on Sutlej (India)' in Gregory L. Possehl, *Harappan Civilization* (New Delhi, 1982), pp. 141-151, figs. 13.5, 13.5, 13.7, 13.8; Y.D. Sharma and G.B. Sharma, 'Bara Culture and its Housing Remains with special reference to Sanghol' *Indian Archaeology—New Perspectives* (Delhi, 1982), pp. 72-82 and illustrations on pottery from Bara and Domeli; Z.D. Ansari and M.K. Davlikar, *Kyatha Excavation* (Poona 1975), pp. 33-39, pl. LII, fig. 15-18; M.N. Deshpande and K.N. Dikshit, 'The Archaeological Assemblage from Ambkheri', *Man and Environment*, Vol. VII, pp. 179-197, fig. 1-8; K.N. Dikshit, 'Late Harappan in northern India', in B.B. Lal and S.P. Gupta, *Frontiers of Indus Civilization* (New Delhi, 1984), pp. 154-169, fig. 30.7, 30.5, 30.8, 30.9; U.V. Singh, 'Late Harappan Cultures as revealed by the excavations at Mirzapur and Daulatpur, District Kurukshetra (Haryana)', *Proceedings of the Seminar on Indus Civilization, Simla, 1977* (Cyclostyled); *Indian Archaeology 1958-59 - A Review*, pp. 50-55, fig. 24; Suraj Bhan, *Excavations at Mitathal and other Explorations in Sutlej-Yamuna Divide*, (Kurukshetra, 1975); Bhagwan Singh, *The Vedic Harappans*, (in press), particularly the chapter on pottery may be referred.

BHAGWANPURA 1975-76,
DISTRICT KURUKSHETRA, HARYANA

EXCAVATIONS AT BHAGWANPURA

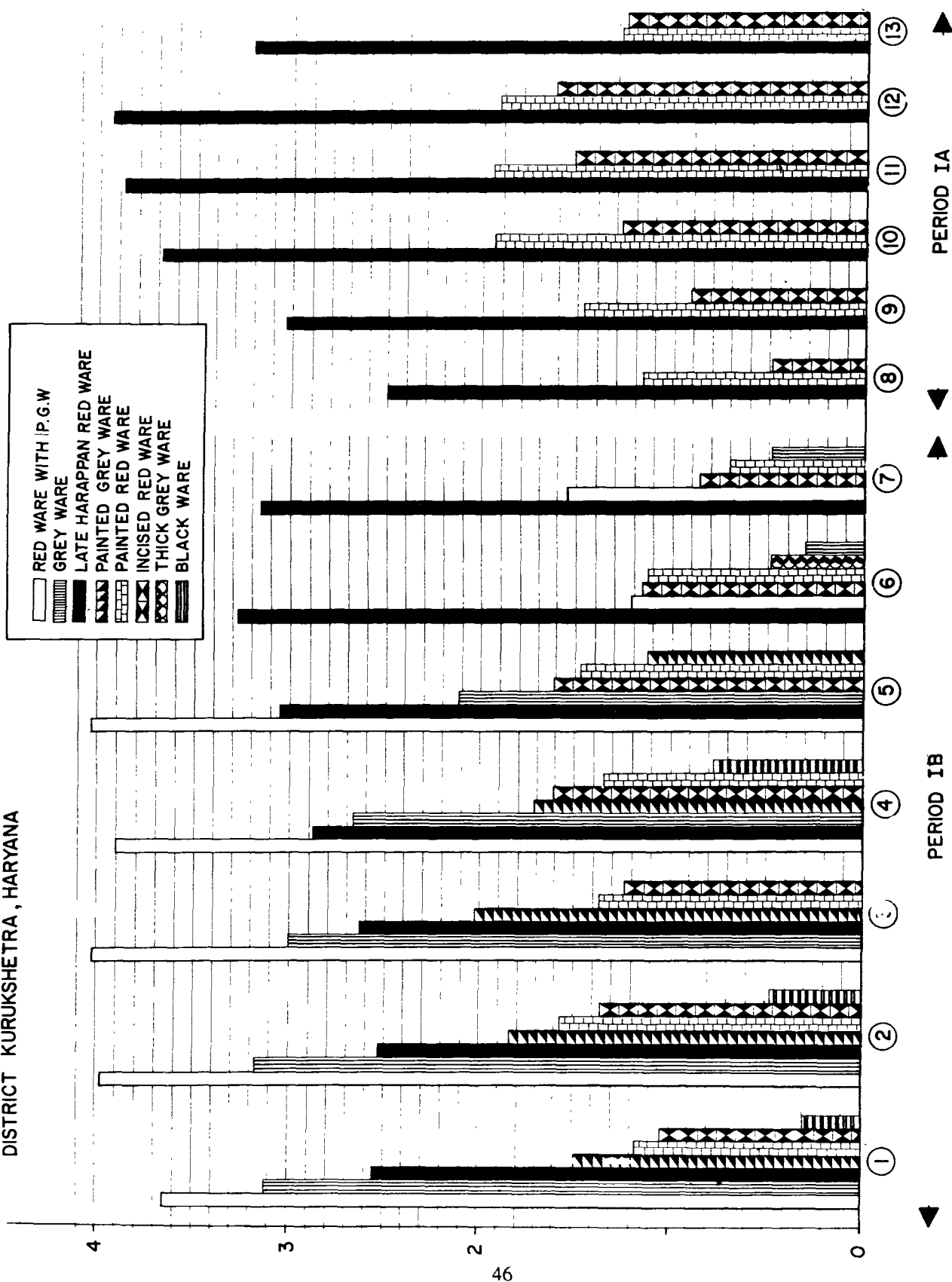


Fig. 8 : Graph showing incidence of pottery

In shapes and designs some divergence has been noticed in case of Painted Grey Ware which is of considerable significance in the present context². Graph at fig. 8 will show complete absence of Painted Grey Ware, red ware of coarse fabric and thick grey ware in Period IA.

Period IB is heralded with grey and red ware followed by Painted Grey Ware as such besides a substantial continuance of the earlier fabrics of Sub-period IA in red ware.

In the late Harappan red ware of both IA and IB Sub-periods, besides dish-on-stands, jars, cups etc., the diagnostic Harappan button based goblets and perforated jars are available. However, beakers are not found. Perforated jars are available in Sub-period IB.

Statistical studies have shown that there has been a sudden downward trend of late Harappan fabrics from 97.48% in layer (6) to 8.10% in layer (5). Another important feature which has been brought to light is the meagre percentage of the Painted Grey Ware i.e., Painted Grey Ware is .09% to 0.49% as compared to grey ware which is 0.92% to 20.54% and the associated red ware varies from 0.87% to 90.37%. This aspect indicates that the associated red ware of a slightly coarse fabric, has been a major ceramic industry in Sub-period IB.

It will be proper to mention here that the flood affected trenches in Sub-period IA have yielded a red ware which is ochrous in appearance. Keeping in view that it is a late Harappan red ware and has become ochrous in appearance due to water action, no separate labelling as such for the ware has been given. Most of the graffiti has been inscribed in this type of ware.

Majority of the red ware pots in late Harappan fabric are not painted. The Cemetery 'H' type is identifiable by its shape and deep red slip. The Bara fabric is recognized by the comparable painted designs and also by some of the shapes and associated incised ware. The late Harappan fabrics have been potted mostly on fast wheel and are made of well levigated clay and fully oxidized core. Generally, in Bara fabric we find that the pots have been made out of a clay which is not so well levigated as the late Harappan ones. Amongst painted designs mostly loop patterns and bands are used and generally these paintings are executed on the shoulder and neck portions of the jars. On the exterior, a fine slip has been used.

A detailed study of pre-Harappan pottery of Kalibangan has revealed that the incised designs which are found at Bhagwanpura, Bara and Mahorana etc., are available in the milieu of Kalibangan pre-Harappan pottery. At Kalibangan the incised designs are available internally (as in fabric 'D') and also externally mainly confined to combed wavy lines of different types on a red ware of a fine variety.

In Sub-period IB, the design repertoire includes some true geometrical designs e.g., maltese cross³ and six petalled flower on Painted Grey Ware which are reminiscent of the earlier painted design tradition. It is interesting that the geometrical designs appear only in the mid-levels of Sub-period IB. The other designs on Painted Grey Ware are check pattern, basket pattern, groups of semi-circles around a group of circles, cactus, group of semi-circles, opposite triangles, finger impression, plant-like motif, horizontal line with dots, thick bands, vertical lines, double loops, intersecting circles, dots, fons, wavy lines, slashes, chain, rope, sigmas, ladder and scissor like design. The red ware found associated with

² B.B. Lal, *Op. cit.*, Vibha Tripathi, *Op. cit.*

³ Maltese cross is available in pre-Harappan and late Harappan pottery. Madhu Bala, 'Maltese Cross in Protohistoric Pottery', *Puratattva*, no. 11, pp. 129-30.

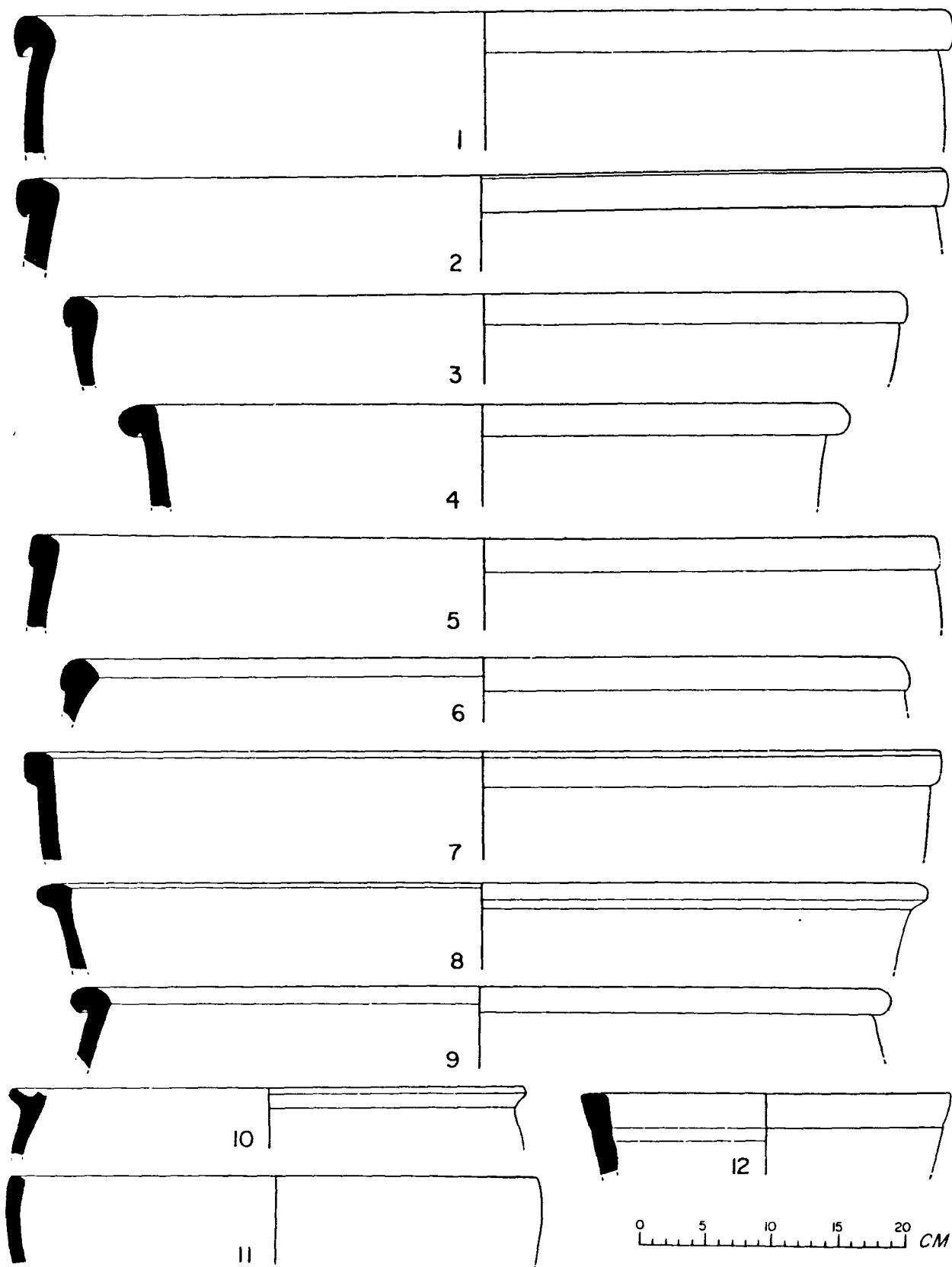


FIG. 9 : Pottery of Sub-period IA

Painted Grey Ware and grey ware is of coarse fabric, and mainly represented by jars and bowls without any paintings. The association of Black ware in the Sub-period, though in meagre quantity, is quite significant. Similarly, a few sherds of thick grey ware of coarse fabric with mat-impressed design is of considerable importance and gives a comparable aspect of such types in red ware in the Painted Grey Ware sites in Rajasthan (pl. XIII).

A significant fact which has been noticed in this period is the imitation of some of the late Harappan shapes in the coarse grey ware (fig. 28).

In Black ware, bowls and dishes are available.⁴

SUB-PERIOD IA

FIG. 9

1. Jar of red ware with internally thickened slightly incurved beaked rim, having straight sides, of medium fabric, showing an oxidized core, treated with a slip. From a mid-level of Sub-period IA.

2. Jar of red ware with out-curved bevelled rim, of medium fabric, showing an incomplete oxidization in the core, treated with a wash. From a mid-level of Sub-period IA.

3. Vase of red ware with a out-turned thickened rim, of a medium fabric, showing an incomplete oxidized core, treated with a wash. From a mid-level of Sub-period IA.

4. Vase of red ware with internally thickened beaded rim and concave-neck, of fine fabric, showing oxidized core, treated with a thick slip. From a mid-level of Sub-period IA.

5. Vase of red ware with an out-turned rim having straight-sides, of medium fabric, showing over oxidized core, applied inside with a thick red slip. From a late level of Sub-period IA.

6. Jar of red ware with a beaded rim and everted neck, of medium fabric, showing an unoxidized core, treated externally with a thick red slip. From an early level of Sub-period IA.

7. Jar of red ware with an out-turned thickened rim, having straight sides, of fine fabric, showing an oxidized core, treated externally with a thick red slip. From a mid-level of Sub-period IA.

8. Jar of red ware with an out-turned thickened rim having straight sides, of medium fabric, showing an incomplete oxidized core, treated with a wash. From a mid-level of Sub-period IA.

9. Jar of red ware with an out-turned flanged rim and concave neck, of medium fabric, showing an incomplete oxidized core, treated with a wash. From a mid-level of Sub-period IA.

10. Jar with a flanged rim and concave neck, of medium fabric, showing an incomplete oxidized core, treated with thick slip on the exterior. From an early level of Sub-period IA.

11. Jar of red ware with featureless rim and incurved concave neck, of medium fabric, showing an incomplete oxidized core, treated with a wash. From a mid-level of Sub-period IA.

12. Jar of red ware with a slightly incurved featureless rim, of coarse fabric, showing an incomplete oxidized core, internally treated with a self slip. From a mid-level of Sub-period IA.

⁴ S. Jamal Hasan, 'Is Black Slipped Ware a separate culture', *Puratan* 1990-92 (in Press).

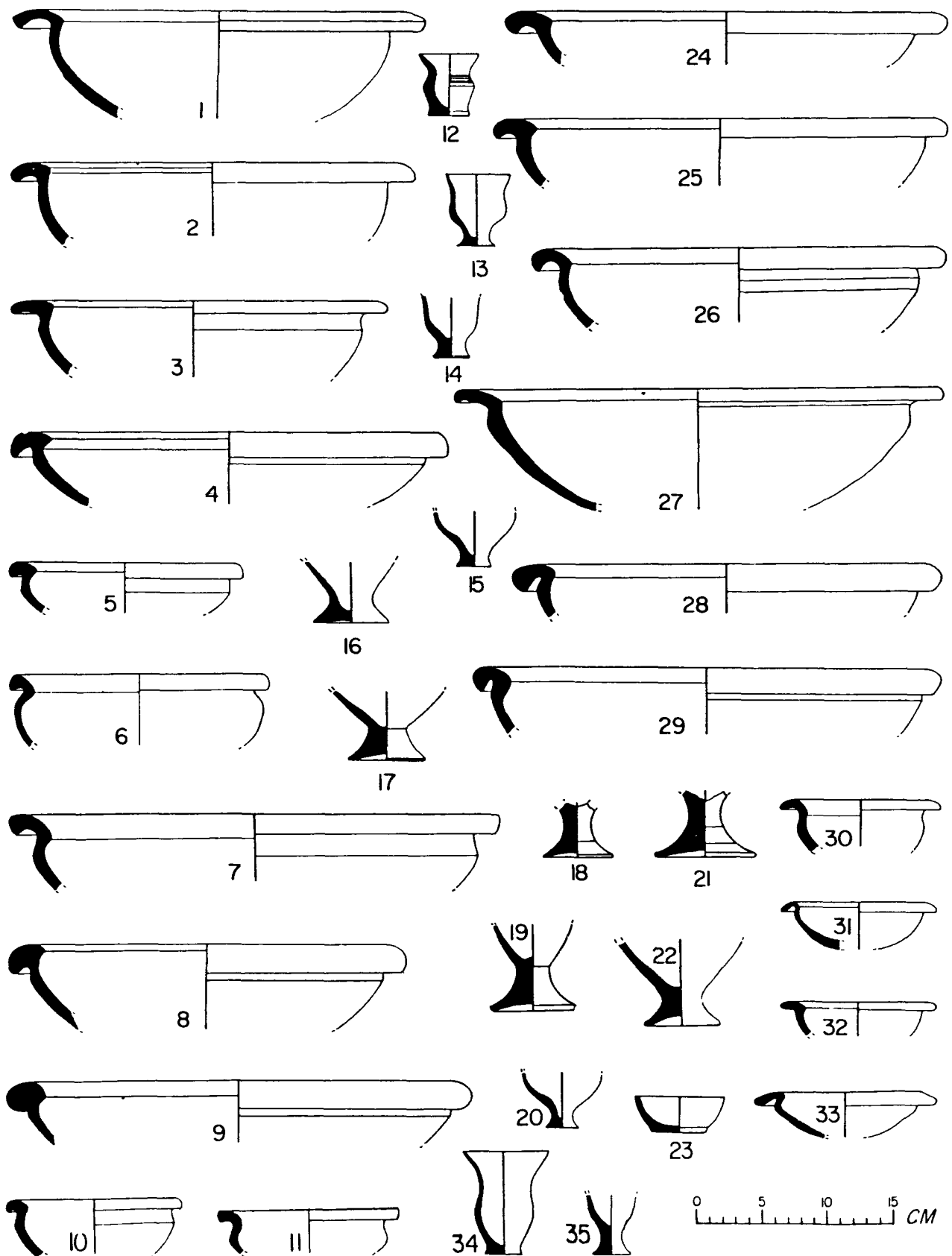
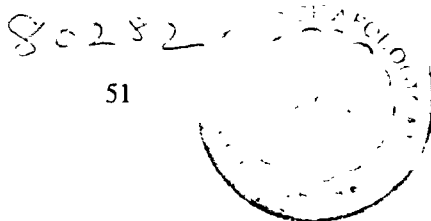


FIG. 10 : Pottery of Sub-period IA

FIG. 10

1. Bowl of red ware with projected-flaring rim, of medium fabric, showing an oxidized core, treated with red slip. From an early level of Sub-period IA.
2. Bowl of red ware containing mica particles on the body with an out-turned flaring rim, of medium fabric, with an incomplete oxidized core, wet-smoothened and is devoid of any surface treatment. From a mid-level of Sub-period IA.
3. Dish of red ware with an out-turned flaring rim, of medium fabric, showing an oxidized core, treated with a slip internally. From a mid-level of Sub-period IA.
4. Dish of thick grey ware with internally thickened flaring rim, of fine fabric, showing incomplete oxidized core, devoid of any slip or wash. From an early level of Sub-period IA.
5. Bowl-cum-lid of red ware with an out-turned, incurved externally rim showing carination on the shoulder, of fine fabric, oxidized, treated with a self-wash. From a mid-level of Sub-period IA.
6. Bowl-cum-lid of red ware with a projected everted rim, of medium fabric, showing an oxidized smoky core, treated with a wash. From a mid-level of Sub-period IA.
7. Dish of red ware with an out-turned, projected, flaring rim, having a carination on the shoulder, of fine fabric, showing an oxidized core, wet-smoothened on the interior and exterior, treated with a wash. From a mid-level of Sub-period IA.
8. Dish of red ware with an out-turned, projected, internally thickened rim, with a carination on the neck, externally grooved, from inside crude having husk-marks and smoky surface, of medium fabric, showing an oxidized core, wet-smoothened, treated with a thick slip in the exterior. From a mid-level of Sub-period IA.
9. Dish of red ware with an out-turned externally grooved beaded rim, incurved, of medium fabric, showing an oxidized core, wet-smoothened, treated with a self-wash. From a late level of Sub-period IA.
10. Bowl-cum-lid of buff ware with an out-turned externally grooved flaring rim, having carination on the shoulder, of medium fabric, showing incomplete oxidized core, wet-smoothened, devoid of any surface treatment. From an early level of Sub-period IA.
11. Bowl-cum-lid of red ware with an out-turned carinated rim, of coarse fabric, having incomplete oxidized core, treated with a red slip. From an early level of Sub-period IA.
12. Miniature vase of red ware with an everted rim and out curved grooved neck having carination on the shoulder, and disc base, of medium fabric, showing oxidized core, treated with a wash. From a mid-level of Sub-period IA.
13. Cup of red ware with slightly out-turned-bevelled rim and bulbous body and button-base, of fine fabric, showing oxidized core, treated with a thin slip. From an early level of Sub-period IA.
14. Cup of red ware with broken rim, bulbous body and button-base, of medium fabric, incomplete oxidized core, treated with red slip in the exterior. From a mid-level of Sub-period IA.
15. Cup of red ware with broken rim having bulbous body and wet-smoothened, flat base, of fine fabric, and oxidized core, treated with a wash. From an early level of Sub-period IA.



16. Cup-on-stand of red ware with broken rim, of fine fabric, showing an incomplete oxidized core, treated with a thick slip on the exterior. From an early level of Sub-period IA.

17. Cup-on-stand of red ware with a broken rim and flaring body, of fine fabric, with an oxidized core, treated with a slip on the exterior. From a mid-level of Sub-period IA.

18. Stand of a cup-on-stand of red ware having concave base, of medium fabric, showing an oxidized core treated with a red slip. From a mid-level of Sub-period IA.

19. Fragment of a cup-on-stand with concave base and bulbous body, of medium fabric, showing an incomplete oxidized core, treated with a slip on the exterior. From a mid-level of Sub-period IA.

20. Cup or globlet of grey ware, having globular body, button-base, of fine fabric, showing a complete oxidized core, wet-smoothened, probably treated with a slip on the exterior. From an early level of Sub-period IA.

21. Stand of a cup-on-stand of red ware with a concave base in red ware, of medium fabric, with a fine core, treated with red slip. From a mid-level of Sub-period IA.

22. Cup-on-stand with a bulbous body and concave base in red ware, of medium fabric, with a fine core, treated with a red slip. From a mid-level of Sub-period IA.

23. Miniature bowl of red ware with featureless rim, of medium fabric, showing a complete oxidized core, treated with self-wash. From an early level of Sub-period IA.

24. Dish of red ware with an out-turned flanged internally projected rim, of medium fabric, showing a complete oxidized core, wet-smoothened, treated with a wash. From a mid-level of Sub-period IA.

25. Dish of red ware with an out-turned flaring internally thickened rim, of coarse fabric, showing an oxidized core, treated with a wash. From a late level of Sub-period IA.

26. Dish of red ware with an everted flanged rim and slightly carinated shoulder and tapering sides, of fine fabric, showing an oxidized core, treated with a slip on the exterior. From an early level of Sub-period IA.

27. Dish of red ware with an out-turned projected flaring rim and tapering sides, of fine fabric, showing an incomplete oxidized core, treated with a red slip on the exterior. From a late level of Sub-period IA.

28. Dish of red ware with thick drooping clubbed rim and carinated shoulder, of medium fabric, showing an oxidized core, treated with a red slip on the interior. From an early level of Sub-period IA.

29. Dish of red ware with an out-turned thickened drooping clubbed rim and carinated shoulder, of medium fabric, showing an oxidized core, treated with a wash. From a mid-level of Sub-period IA.

30. Bowl-cum-lid of red ware with on-turned flaring rim, of medium fabric, showing completely oxidized core, treated with a wash. From a late level of Sub-period IA.

31. Bowl-cum-lid of red ware with an out-turned everted rim, of medium fabric, showing an oxidized core, treated with a wash. From a mid-level of Sub-period IA.

32. Bowl-cum-lid of red ware with an out-turned thickened flaring rim, of medium fabric, showing an oxidized core, treated with a slip on the interior. From an early level of Sub-period IA.

33. Bowl-cum-lid of red ware with an everted rim and carinated shoulder, of medium fabric,

showing an incomplete oxidized core, treated with a slip on the interior. From an early level of Sub-period IA.

34. Vase with bulbous body and flaring rim with a flat base of red ware, of medium fabric, having an oxidized core, from an early level of Sub-period IA.

35. Cup-on-stand with a bulbous body, rim missing, of medium fabric, having an oxidized core. From an early level of Sub-period IA.

FIG. 11

1. Dish of a dish-on-stand with a long slanting drooping rim of red ware, thick fabric, showing an oxidized core, treated internally with a slip. From a mid-level of Sub-period IA.

2. Dish of a dish-on-stand with a short-drooping incurved rim of red ware, of thick fabric with prominent husk-marks on the interior and exterior, showing an incomplete oxidized grey core, treated with a wash. From an early level of Sub-period IA.

3. Fragment of dish-on-stand with drooping rim of red ware painted in black making a pattern of vertical and horizontal opposed triangles, of thick fabric, showing an oxidized red core, treated with brownish red slip. From a mid-level of Sub-period IA.

4. Dish of dish-on-stand with long drooping rim of red ware, thick fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.⁵

5. Fragment of a dish-on-stand of red ware with short drooping incurved rim, of thick fabric, showing an oxidized core. From a mid-level of Sub-period IA.

6. Fragment of a dish-on-stand of red ware with short drooping slightly incurved rim, of medium fabric, showing an oxidized red core, wet-smoothened, treated with red slip on the interior. From a mid-level of Sub-period IA.

7. Dish of dish-on-stand of red ware with a short drooping clubbed rim, of fine fabric, showing an oxidized red core, treated with a red slip. From a mid-level of Sub-period IA.

8. Dish of a dish-on-stand of red ware with projected out-curved clubbed rim, of medium fabric, showing an oxidized core, wet-smoothened, treated with a red wash. From an early level of Sub-period IA.

9. Dish of grey ware with an out-turned flaring undercut rim, of thick fabric, showing an incomplete oxidized grey core, treated with a wash. From an early level of Sub-period IA.

10. Dish of red ware with an out-turned flaring rim painted in black, showing vertical and horizontal thin and thick bands, of thick fabric and oxidized red core. From a mid-level of Sub-period IA.

11. Dish of red ware with an out-turned flaring undercut rim, of medium fabric, showing oxidized red core, treated with a red wash. From a mid-level of Sub-period IA.

12. Dish with incurved featureless rim in red ware with a deep groove, of medium fabric, an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

⁵ cf. Ambakheri, *Op. cit.*, fig. 4.1, p, 187 also at Alamgirpur and Hulas.

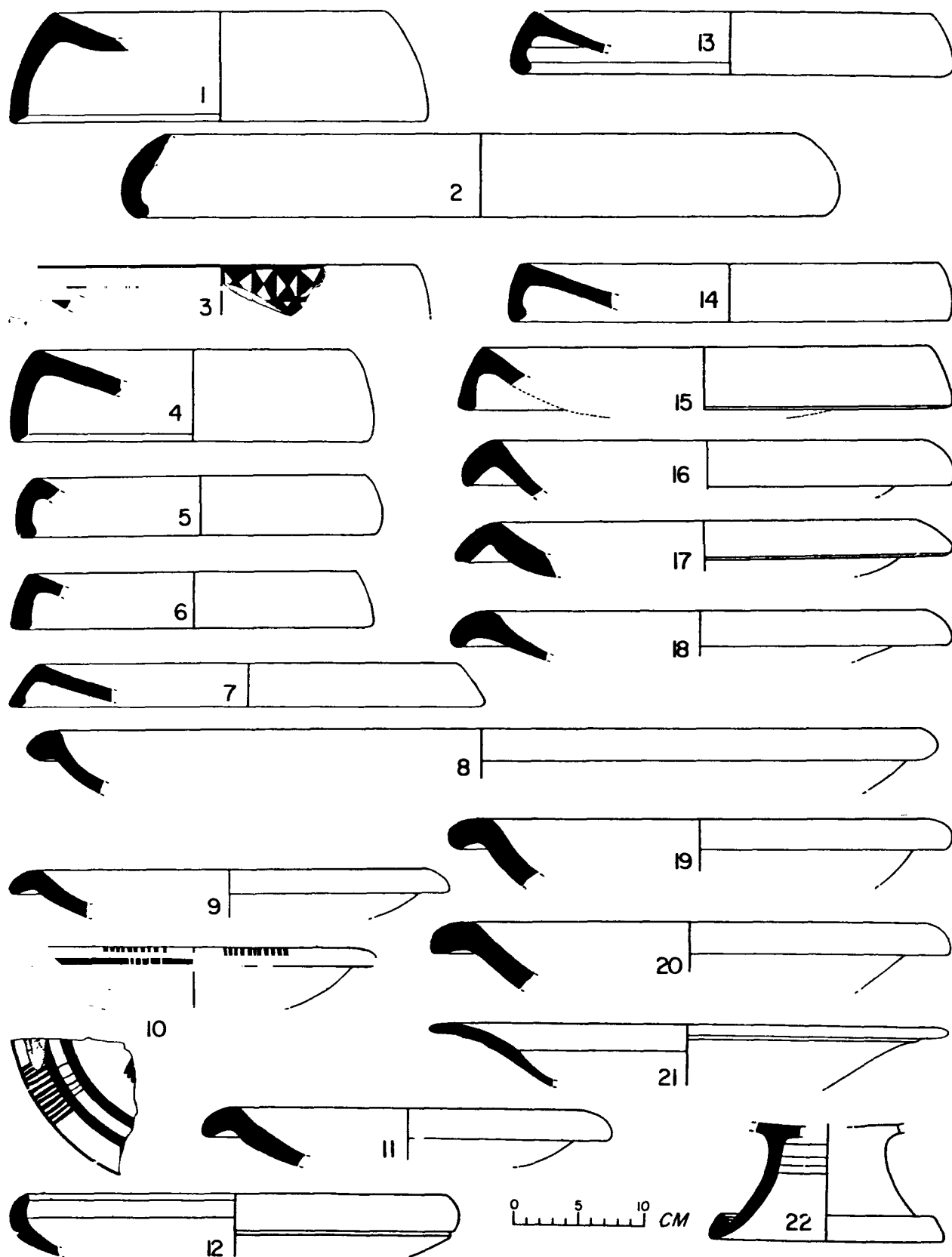


FIG. 11 : Pottery of Sub-period IA

13. Dish of a dish-on-stand in red ware having short drooping incurved rim with a ridge, of medium fabric, showing an oxidized core, treated with a wash. From a mid-level of Sub-period IA.
14. Dish of a dish-on-stand red ware with a short drooping and incurved rim, of medium fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.
15. Fragment of dish-on-stand of red ware with short drooping thickened rim, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IA.
16. Dish of dish-on-stand of red ware with an out-turned thickened undercut rim, of medium fabric, showing an oxidized core, treated with a self-slip. From a mid-level of Sub-period IA.
17. Dish of red ware with an out-turned undercut rim, of fine fabric, showing an oxidized core, treated with a brown slip. From a late level of Sub-period IA.
18. Dish of red ware with an out-turned thickened undercut rim, of medium fabric, showing an oxidized core, treated with a wash. From an early level of Sub-period IA.
19. Dish of red ware with an out-turned undercut rim, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.
20. Dish of red ware with an out-turned thickened undercut rim, of thick fabric, showing an oxidized core treated with a wash. From an early level of Sub-period IA.
21. Dish of red ware with a long flaring rim, of medium fabric, showing an incomplete oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.
22. Stand of a dish-on-stand of red ware with a short stem and a raised edge at the concave sided base, of medium fabric, showing an oxidized core, treated with an ochre slip on the exterior, wet smoothened. From a late level of Sub-period IA.

FIG. 12

1. Basin of red ware with an out-turned externally grooved beaded rim, of medium fabric, showing an oxidized core, treated with a red slip on the exterior. From a mid-level of Sub-period IA.
2. Basin of red ware with an out-turned collared rim, with tapering shoulder, of medium fabric, showing an oxidized core, treated with a wash. From a late level of Sub-period IA.
3. Basin of red ware with an out-turned thickened rim, of coarse fabric, showing an incomplete oxidized core and surface, treated with a self wash. From a late level of Sub-period IA.
4. Basin of red ware with a slightly out-turned beaded rim and tapering shoulder, of medium fabric, showing an oxidized core, treated with a wash. From a mid-level of Sub-period IA.
5. Basin of red ware with a beaded rim, of medium fabric, showing an oxidized core, treated with a brown slip on the exterior. From a late level of Sub-period IA.
6. Basin of red ware with an out-turned undercut beaded rim tapering shoulder, of medium fabric, showing an incomplete oxidized core, wet-smoothened, treated with a wash. From a mid-level of Sub-period IA.
7. Basin of thick red ware with an out-turned grooved rim, of coarse fabric, showing an incomplete oxidized core, treated with a wash. From an early level of Sub-period IA.
8. Basin of red ware with slightly inturned featureless rim, painted in black colour with a design

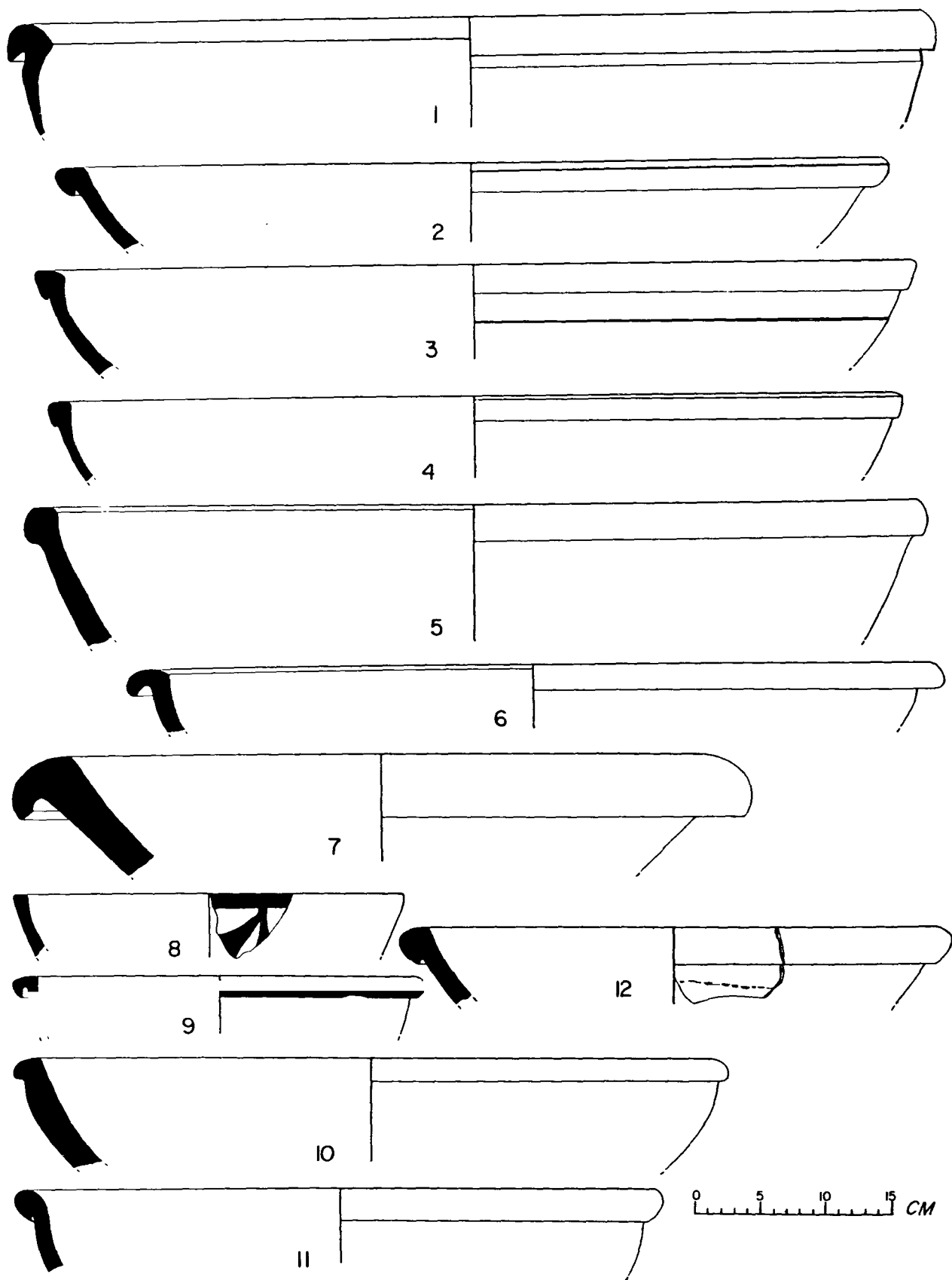


FIG. 12 : Pottery of Sub-period IA

having a horizontal band with two flaring bands, of medium fabric having an oxidized core. From a mid-level of Sub-period IA.

9. Basin of red ware with an out-turned beaded undercut rim having incurved shoulder, with a black band painted on it, of medium fabric, showing an oxidized core, treated with slip on the exterior. From a late level of Sub-period IA.

10. Thick basin of red ware with an out-turned thickened rim and tapering shoulder, of coarse fabric, showing an oxidized core, treated with a wash. From an early level of Sub-period IA.

11. Basin of red ware with a collared rim, and tapering shoulder, of medium fabric, showing an oxidized core, treated with a slip. From a late level of Sub-period IA.

12. Basin of red ware with an out-turned thickened collared rim, having a horizontal line of notched pattern on the tapering shoulder, of medium fabric, showing an oxidized core, treated with thick wash. From a mid-level of Sub-period IA.

FIG.13

1. Jar of red ware with a collared rim, of medium fabric, showing an oxidized core, treated with slip. From a mid-level of Sub-period IA.⁶

2. Jar of red ware with a collared rim, of medium fabric, showing an oxidized core with a red wash. From an early level of Sub-period IA.

3. Jar of red ware with a collared rim, painted in black with thick horizontal bands on neck and rim, of medium fabric, well oxidized, treated with red thick slip on the exterior. From a mid-level of Sub-period IA.

4. Jar of red ware with a collared rim, of medium fabric, showing an oxidized core, treated with a wash. From an early level of Sub-period IA.

5. Fragment of a vase of red ware with an out-turned beaded undercut rim and concave neck, of medium fabric, showing an oxidized core, treated with a wash. From an early level of Sub-period IA.

6. Vase of red ware with an out-turned beaked undercut rim, concave long neck, of fine fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

7. Vase of red ware with an out-turned undercut rim and concave long neck, of medium fabric, showing an incomplete oxidized core, treated with a wash. From late level of Sub-period IA.⁷

8. Vase of red ware with an out-turned thickened rim cut obliquely, of coarse fabric, showing an oxidized core and smoky surface, treated with a wash. From a late level of Sub-period IA.

9. Jar of red ware with broken rim and long neck, painted with black horizontal band, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

10. Vase of red ware with an out-turned everted rim and concave neck, of medium fabric, showing an oxidized core. From an early level of Sub-period IA.

11. Vase of red ware with an out-turned thickened rim cut obliquely, of medium fabric, showing an incomplete oxidized core. From an early level of Sub-period IA.

⁶ Cf. Mahorana, *op. cit.*, fig. 6.25.

⁷ High necked jars are reported from Ambakheri, *op. cit.*, Fig. 5, p. 186.

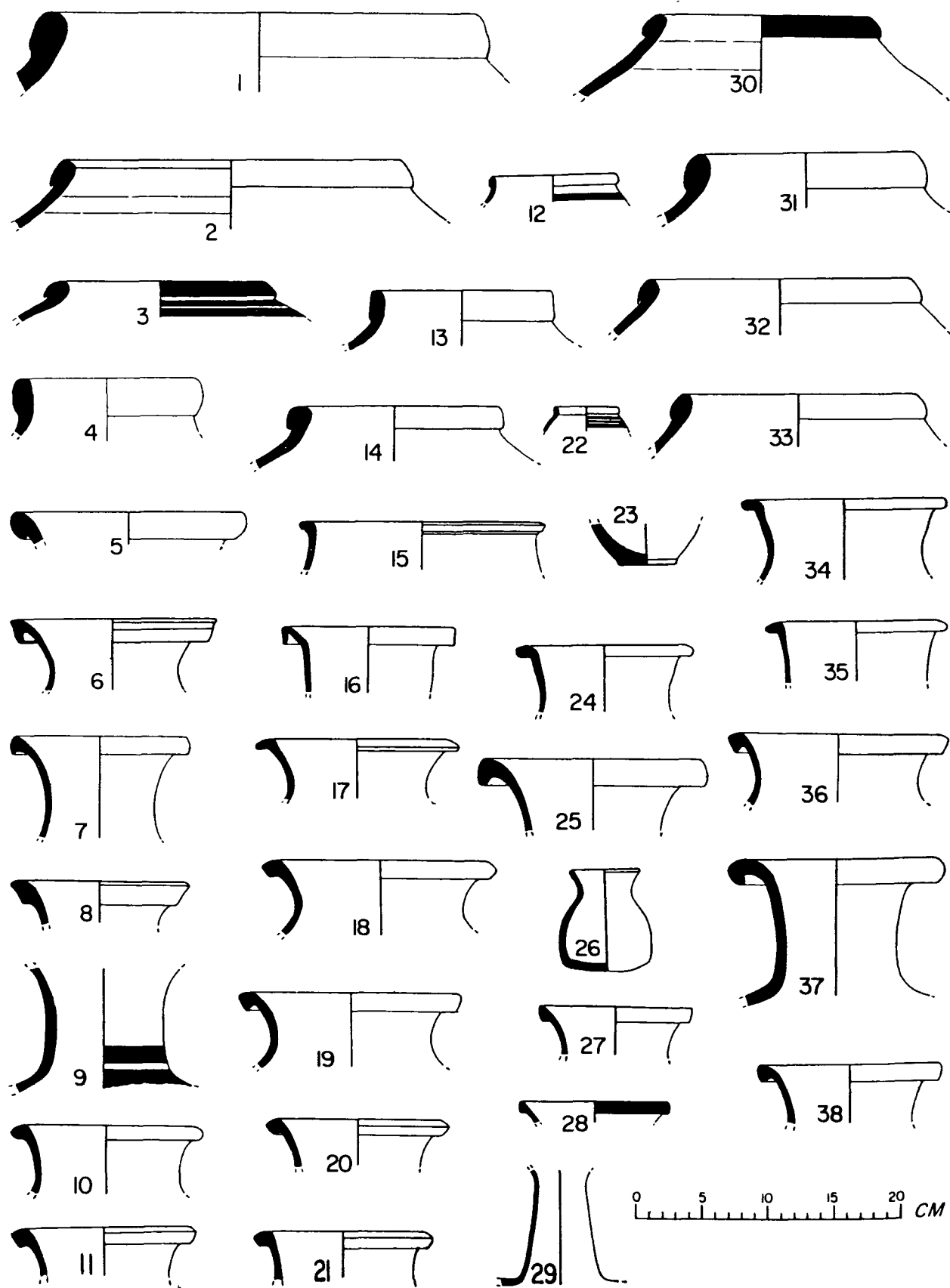


FIG. 13 : Pottery of Sub-period IA

12. Small vase of red ware with beaded rim, painted in black with a design of horizontal band, of medium fabric, showing an oxidized core, treated with a wash. From a mid-level of Sub-period IA.

13. Jar of red ware with a collared rim, of medium fabric, showing an incomplete oxidized core, treated with a red slip on the exterior. From a mid-level of Sub-period IA.

14. Jar of red ware with an out-turned collared rim, of medium fabric, showing an oxidized core, wet-smoothened, treated with an ochre wash. From an early level of Sub-period IA.

15. Vase of red ware with an out-turned projected rim, of fine fabric, showing an oxidized core, treated with ochre slip on the exterior. From a mid-level of Sub-period IA.

16. Vase of red ware with an everted beaked undercut rim and straight shoulder, of medium fabric, and showing an oxidized core, treated with a slip on the exterior. From a late level of Sub-period IA.

17. Vase of grey ware with an out-turned flaring rim and concave neck, of medium fabric, showing an unoxidized core, devoid of any surface treatment. From a mid-level of Sub-period IA.

18. Vase of red ware with an out-turned thickened obliquely cut rim and concave neck, of medium fabric, showing an oxidized core. From an early level of Sub-period IA.

19. Vase of red ware with an out-turned obliquely undercut rim and concave neck, of medium fabric, showing an oxidized core, treated with a wash. From a late level of Sub-period IA.

20. Vase of red ware with a clubbed undercut rim, of medium fabric, showing an incomplete oxidized core, treated with a wash. From an early level of Sub-period IA.

21. Vase of red ware with a projected rim, of medium fabric, showing an oxidized core, treated inside with a red slip. From an early level of Sub-period IA.

22. Miniature jar of red ware with an everted rim, painted in black with horizontal bands, of fine fabric, showing an oxidized core, treated with thick red slip on the exterior. From a mid-level of Sub-period IA.

23. Fragment of the base of a deep bowl of red ware with broken rim, flat base, of medium fabric, with an oxidized core. From an early level of Sub-period IA.

24. Vase of red ware with an out-turned flaring slightly undercut rim, of medium fabric, showing an oxidized core, treated with a thick red wash. From an early level of Sub-period IA.

25. High necked jar of red ware with an out-turned thickened beaded rim and concave shoulder, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IA.

26. Miniature vase of grey colour in red ware with an everted featureless rim and tapering shoulder and flat base, of medium fabric, showing an incomplete oxidized core and surface devoid of any treatment. From a mid-level of Sub-period IA.

27. Vase of red ware with clubbed undercut rim, of coarse fabric, showing incomplete oxidized core and surface treated with a red slip on the exterior. From an early level of Sub-period IA.

28. Miniature jar of red ware with an out-turned thickened rim, of coarse fabric, showing an incomplete oxidized core, treated with red slip. From a mid-level of Sub-period IA.

29. Neck portion of a high necked jar of red ware with straight narrow neck, of fine fabric, showing oxidized core, treated with a self slip. From a mid-level of Sub-period IA.

30. Jar of red ware with a collared rim, of medium fabric, showing an incomplete oxidized core, treated with a red slip. From an early level of Sub-period IA.

31. Jar of red ware with a collared rim, and concave neck, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

32. Jar of red ware with a collared rim, and tapering shoulder, of medium fabric, showing an oxidized core, treated with an ochre wash. From a middle level of Sub-period IA.

33. Jar of red ware with a collared rim, and tapering shoulder, of medium fabric, showing an incomplete oxidized core, treated with a cream-slip on the exterior. From an early level of Sub-period IA.

34. Jar of red ware with a projected rim and concave neck, of medium fabric, showing an incomplete oxidized core, treated with a red wash. From an early level of Sub-period IA.

35. Vase of red ware flanged undercut rim and straight shoulder, of medium fabric, showing an oxidized core, treated with a wash. From an early level of Sub-period IA.

36. Vase of red ware with an out-turned thickened obliquely cut rim and concave shoulder, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

37. High necked jar of red ware with an out-turned beaded undercut rim, of medium fabric, showing an oxidized core, treated with red thick slip. From a middle level of Sub-period IA.

38. Vase of red ware with beaded undercut rim and concave shoulder, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

FIG. 14

1. Stem portion of a dish-on-stand of red ware having corrugation on the exterior, of thick fabric, showing an oxidized core, treated with a thick slip. From a mid-level of Sub-period IA.

2. Stem portion of dish-on-stand of red ware having corrugation on the exterior with a luted broken dish, of medium fabric, showing an oxidized core, treated with a wash. From a mid-level of Sub-period IA.

3. Wide stem portion of a dish-on-stand of red ware with corrugation, of thick fabric, showing an oxidized core, wet-smoothened, treated with an ochre wash. From an early level of Sub-period IA.

4. Stem portion of dish-on-stand of red ware with corrugation in the exterior, thick fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

5. Fragment of a stem portion of dish-on-stand of red ware with corrugation in the exterior, of coarse fabric, showing an oxidized core, treated with an ochre slip in the exterior. From a mid-level of Sub-period IA.

6. Fragment of a stem of dish-on-stand of red ware, with flaring stem, of medium fabric, showing an incomplete oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

7. Portion of a dish-on-stand of red ware with flaring sides of the stem, of medium fabric, showing a complete oxidized core, treated with an ochre slip on the exterior. From a mid-level of Sub-period IA.

8. Portion of a dish-on-stand of red ware with flaring sides of the stem, of medium fabric, showing an oxidized core, wet-smoothened, treated with red slip. From an early level of Sub-period IA.

9. Fragment of a squat dish-on-stand of red ware with short stem, of medium fabric, showing an oxidized core, treated with a self wash. From an early level of Sub-period IA.

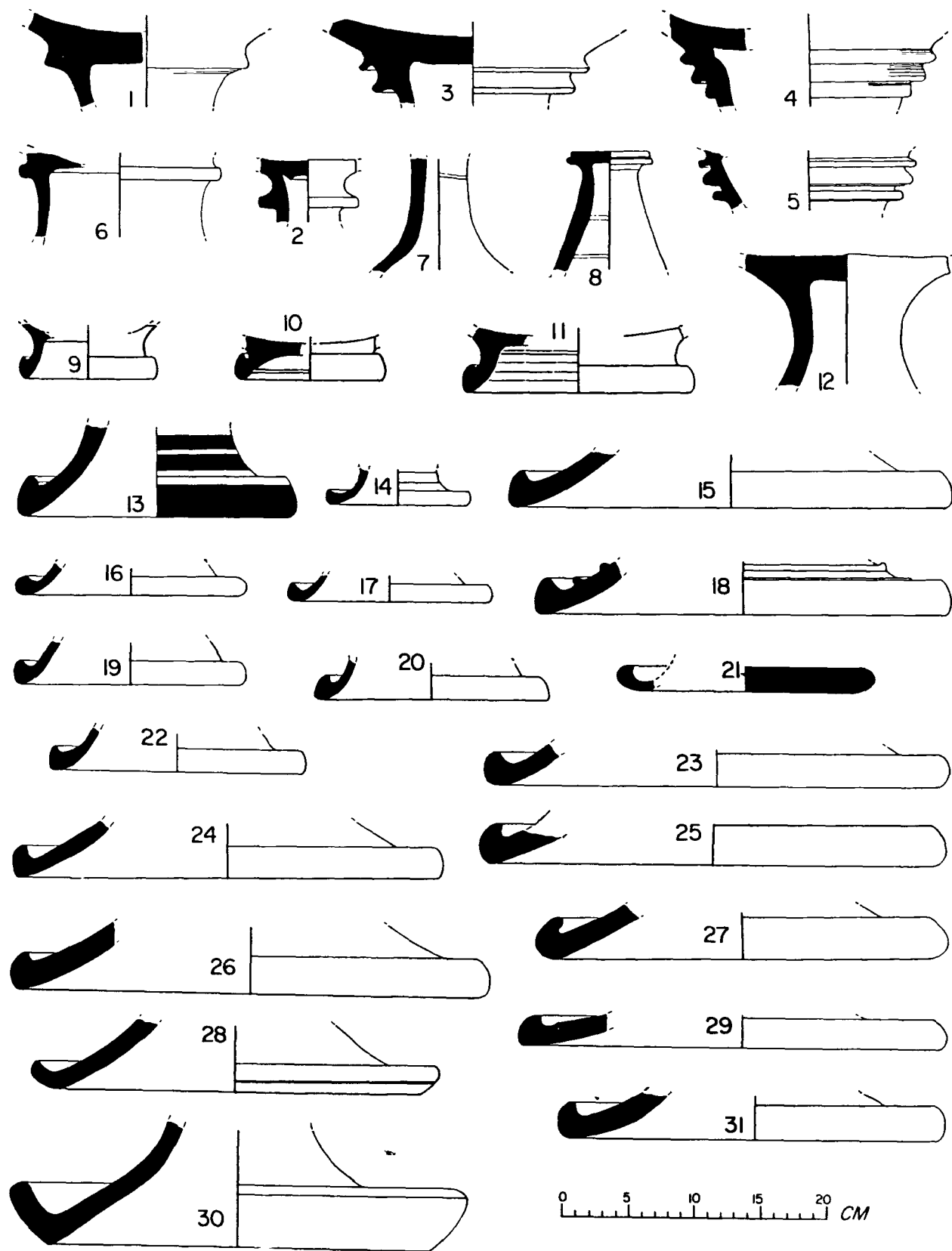


FIG.14 : Pottery of Sub-period IA

10. Fragment of a dish-on-stand of red ware with a raised edge on the base, in coarse fabric, showing an incomplete oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

11. Fragment of a squat dish-on-stand of red ware with a short stem and a raised edge on the base of medium fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

12. Fragment of a dish-on-stand of red ware with flaring sides, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IA.

13. Fragment of a dish-on-stand of red ware with raised edge, on the base painted in black with horizontal thick bands, of medium fabric, showing well oxidized core, treated with red slip. From a late level of Sub-period IA.

14. Fragment of a dish-on-stand of red ware with a ridge on the base, of thin fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

15. Fragment of a dish-on-stand of red ware, of medium fabric, showing an unoxidized core, treated with an ochre slip. From an early level of Sub-period IA.

16. Dish-on-stand of red ware with raised edge on the base, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

17. Stand of a dish-on-stand of red ware with raised edge on the base, of medium fabric, showing an oxidized core, treated with a buffish slip. From an early level of Sub-period IA.

18. Stand of a dish-on-stand of red ware with corrugated exterior and a raised edge on the base, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

19. Stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing an oxidized core, treated with a self-wash. From an early level of Sub-period IA.

20. Stand of a dish-on-stand of red ware with a raised edge on the base, of thin fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

21. Fragment of a dish-on-stand of red ware with an incurved raised edge on the base, of medium fabric, showing an oxidized core, having a black band on the exterior. From an early level of Sub-period IA.

22. Stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IA.

23. Stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

24. Stand of a dish-on-stand of red ware with raised edge on the base, of medium fabric, showing an oxidized core, treated with a red slip in the exterior. From a late level of Sub-period IA.⁸

25. Stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing an incomplete oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

26. Stand of a dish-on-stand of red ware with a raised edge on the base, of coarse fabric, showing oxidized core, treated with fine red slip on the exterior. From an early level of Sub-period IA.

27. Stand of a dish-on-stand of red ware with an incurved raised edge on the base, of fine fabric, showing a complete oxidized core, treated with a red thick slip. From a late level of Sub-period IA.

⁸ Cf. Mahorana *Op. cit.*, fig. 8.51; *Ancient India*, No. 3, fig. 11, no. 1f., also at Sanghol and Domeli.

28. Stand of a dish-on-stand of red ware with a raised edge on the base, of a medium fabric, showing complete oxidized core, treated with a red slip on the exterior. From an early level of Sub-period IA.

29. Stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing a complete oxidized core, treated with a red slip on the exterior. From an early level of Sub-period IA.

30. Stand of a dish-on-stand of red ware with a prominent raised edge on the base, of coarse fabric, showing an incomplete oxidized core, treated with a red wash. From a mid-level of Sub-period IA.

31. Stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IA.

FIG. 15

1. High necked jar of red ware with an out-turned beaked undercut rim and concave neck, of medium fabric, showing an incomplete oxidized core, treated externally with a red slip. From an early level of Sub-period IA.

2. High necked jar of red ware with an out-turned flanged undercut rim, of medium fabric, showing an incomplete oxidized core, treated externally with a red slip which has almost peeled off. From an early level of Sub-period IA.

3. High necked jar of red ware with a flaring undercut rim and concave neck, of medium fabric, showing an oxidized core, treated with a self wash. From an early level of Sub-period IA.

4. Jar of red ware with an out-turned beaked rim and concave neck, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

5. Vase of red ware with an out-turned flanged undercut rim, of coarse fabric, showing an incomplete oxidized core, treated with a self wash. From an early level of Sub-period IA.

6. Vase of red ware with an out-turned flanged undercut rim, of medium fabric, showing an incomplete oxidized core, treated with a cream wash. From an early level of Sub-period IA.

7. High necked jar of red ware with an out-turned flaring undercut rim, of medium fabric, showing complete oxidized core, treated with a self slip. From an early level of Sub-period IA.

8. Miniature vase of red ware with an out-turned beaked undercut rim of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

9. High necked jar of red ware with a flanged undercut rim, of medium fabric, showing an highly oxidized core, treated with a cream wash. From an early level of Sub-period IA.

10. Vase of red ware with an out-turned beaked undercut rim and concave neck, of medium fabric, showing highly oxidized core, treated with a red wash. From an early level of Sub-period IA.

11. Vase of red ware in buff colour with a beaked undercut rim and tapering shoulder, of fine fabric, showing an incomplete oxidized very thin core, treated with a self wash. From an early level of Sub-period IA.

12. Vase of red ware with a projected rim, of medium fabric, showing an incomplete oxidized core, treated with a red wash. From an early level of Sub-period IA.

13. Fragment of base of a jar of red ware with a ring pedestal, of medium fabric, showing an oxidized smoky core, treated with a cream slip. From a mid-level of Sub-period IA.

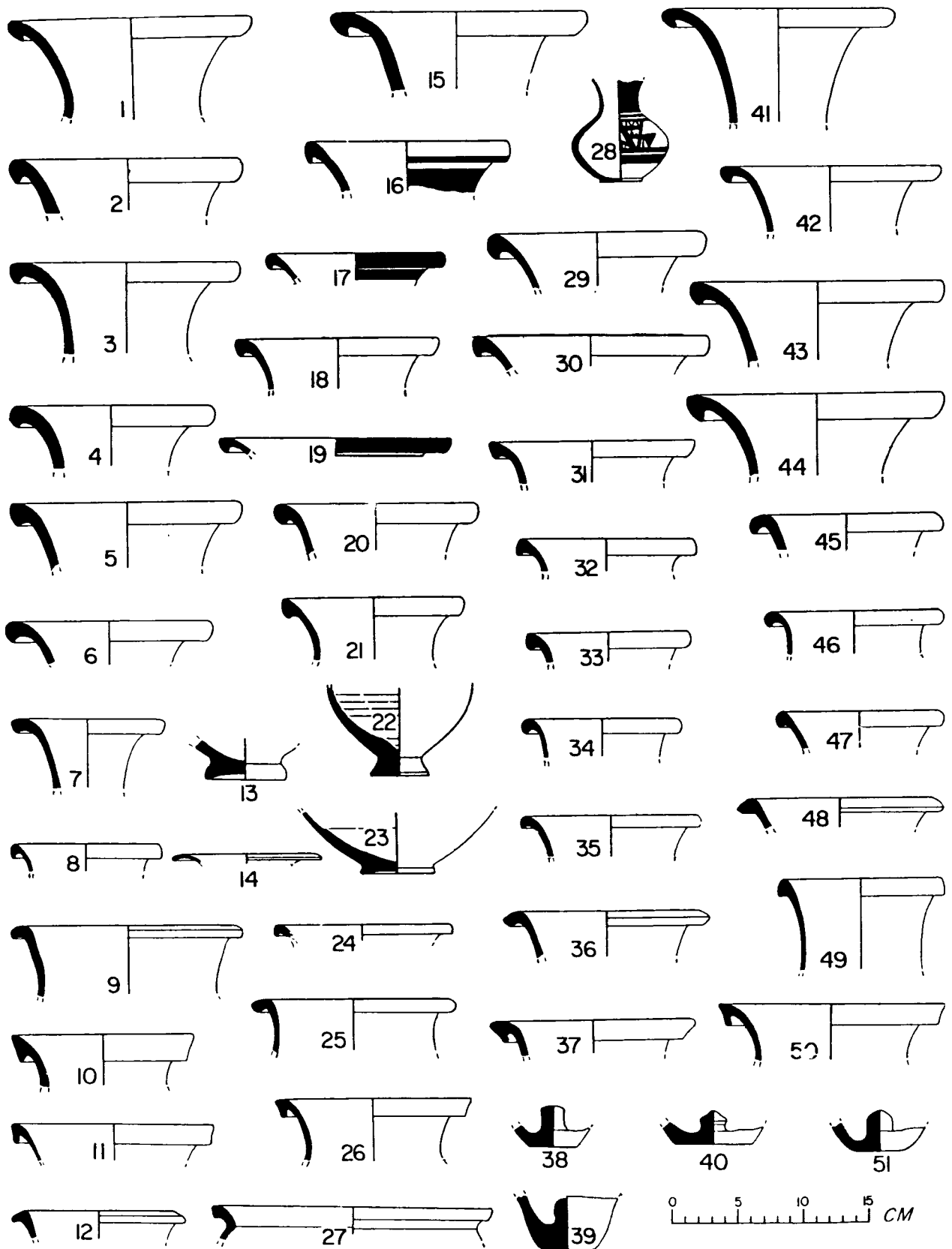


FIG.15 : Pottery of Sub-period IA

14. Miniature vase of red ware with an out-turned flaring undercut rim, of fine fabric, showing an oxidized thin core, treated externally with a slip. From an early level of Sub-period IA.

15. High necked jar of red ware in buffish colour with an out-turned flanged undercut rim and concave neck of medium fabric, showing an oxidized core, treated with a self slip. From a mid-level of Sub-period IA.

16. High necked jar of red ware with a beaked undercut rim having painted horizontal thick bands in black, of medium fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IA.

17. Miniature jar of red ware with an out-turned flaring undercut rim, painted in black, of medium fabric, showing highly oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

18. High necked jar of red ware with an out-turned undercut flanged rim and concave neck, of medium fabric, having an oxidized core, treated with a red wash. From an early level of Sub-period IA.

19. Vase of red ware with a beaked undercut rim painted in black, of medium fabric, showing an incomplete oxidized core, treated with a brown slip on both sides of the rim. From a mid-level of Sub-period IA.

20. Vase of red ware with a beaded undercut rim and tapering shoulder, of coarse fabric, showing oxidized core, treated with a cream wash. From an early level of Sub-period IA.

21. High necked jar of red ware with an out-turned thickened rim and concave neck, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

22. Fragment of a cup of red ware with discular flat pedestal, of fine fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.⁹

23. Fragment of a bowl of red ware with a discular flat base, of fine fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

24. Fragment of a vase of red ware with a beaked undercut rim, of fine fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IA.

25. Vase of red ware with an out-turned flaring undercut rim and with straight neck, of medium fabric, showing an oxidized core, treated externally with red slip. From an early level of Sub-period IA.

26. Vase of red ware with beaked undercut rim and concave neck, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IA.

27. Vase of red ware with an out-turned rim, of coarse fabric, showing incomplete oxidized core, treated with a red wash. From an early level of Sub-period IA.

28. Miniature vase of red ware with broken rim and concave neck, painted with overlapping triangles in between horizontal bands, of medium fabric, showing an oxidized core, treated with an ochre wash, wet-smoothened. From an early level of Sub-period IA.

29. Vase of red ware with an out-turned beaked undercut rim in red ware, of medium fabric, showing an oxidized core, wet-smoothened, treated with an ochre wash. From an early level of Sub-period IA.

30. Vase of red ware with an out-turned flanged undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IA.

⁹ Cf. *Op. cit.*, fig. 15.3, Bahadarabad, Atranjikhara, Lal Qila, Harappa.

31. Vase of red ware with a flanged undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

32. Vase of red ware with a flanged undercut rim, of fine fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

33. Vase of red ware with a flanged undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

34. Vase of red ware with an out-turned flanged undercut rim of medium fabric, showing an oxidized core. From an early level of Sub-period IA.

35. Vase of red ware with an out-turned flanged undercut rim, of medium fabric, showing an oxidized core, wet-smoothened, treated with an ochre wash. From an early level of Sub-period IA.

36. Vase of red ware with an out-turned flaring undercut rim, of medium fabric, showing an incomplete oxidized smoky core, treated with a red wash. From an early level of Sub-period IA.

37. Vase of red ware with beaked undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

38. Lid of red ware with a prominent cylindrical knob, of medium fabric, showing an incomplete oxidized core, treated with a red wash. From an early level of Sub-period IA.

39. Lid of red ware with short knob, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IA.

40. Fragment of a lid in red ware with a conical short knob in the centre, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IA.

41. High necked jar of red ware in buffish colour with a beaked undercut rim, of medium fabric, showing an incomplete oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

42. High necked jar of red ware with a beaked undercut rim, of medium fabric, showing an oxidized core, treated with a red ochre wash. From an early level of Sub-period IA.

43. High necked jar of red ware with an out-turned flanged undercut rim, of medium fabric, showing incomplete oxidized core, treated externally and in neck portion internally with a red slip. From an early level of Sub-period IA.

44. High necked jar of red ware with a prominent beaked undercut rim, of coarse fabric, showing an incomplete oxidized core, treated with an ochre wash. From a late level of Sub-period IA.

45. Vase of red ware with an out-turned flanged undercut rim, of medium fabric, showing an incomplete oxidized core, treated with a bright ochre slip. From an early level of Sub-period IA.

46. Vase of red ware out-turned beaked undercut rim, of medium fabric, showing an incomplete oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

47. Vase of red ware with an undercut beaded rim, of medium fabric, showing complete oxidized core, treated with an ochre wash. From an early level of Sub-period IA.

48. Vase of red ware with a beaded rim, of medium fabric, showing complete oxidized core, treated with pinkish wash. From an early level of Sub-period IA.

49. High necked jar of red ware with a flanged rim and straight neck, of fine fabric, showing an incomplete oxidized core, treated externally with a thick brown slip. From an early level of Sub-period IA.

50. High necked jar of red ware with beaked undercut rim, of medium fabric, showing an oxidized core, treated with a red ochre wash. From an early level of Sub-period IA.

51. Lid of red ware with a cylindrical knob, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IA.

SUB-PERIOD IB

FIG. 16

1. Big jar of red ware with a collared beaked undercut rim, wide mouth, tapering shoulder, painted in black with thick horizontal bands, of medium fabric, showing an oxidized core, treated externally with a red slip. From an early level of Sub-period IB.

2. Jar of red ware with an out-turned collared rim, and concave shoulder with a globular body, decorated with black horizontal bands, of medium fabric, showing an oxidized core, treated externally with a red slip. From an early level of Sub-period IB.

3. Jar of red ware with an out-turned collared rim, and tapering shoulder, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

4. Jar of red ware with a collared rim, of medium fabric, showing a complete oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

5. Vase of red ware with an out-turned obliquely cut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an late level of Sub-period IB.

6. Complete vase of red ware with a beaked rim concave neck and flat base, decorated with horizontal thick and thin bands, arches filled with oblique parallel line in black, of medium fabric, showing a complete oxidized core, treated with a red wash. From an early level of Sub-period IB.

7. Vase of red ware with an out-turned undercut beaded rim and concave neck, of medium fabric, showing incomplete oxidized core treated with an ochre wash. From an early level of Sub-period IB.

8. Vase of red ware with beaded rim and concave neck, painted on rim and neck with horizontal bands, of medium fabric, showing an oxidized core, treated externally with a red wash. From an early level of Sub-period IB.

9. Vase of red ware with beaded rim and concave neck, of coarse fabric, showing an incomplete oxidized core, treated with a red wash. From a late level of Sub-period IB.

10. Vase of red ware with an out-turned featureless rim, spherical body and discular flat base, with two curvilinear bands painted in black, of coarse fabric, showing an incomplete oxidized greyish section, treated with a red wash. From a late level of Sub-period IB.

11. Vase of red ware with an out-turned thickened rim of medium fabric, showing an incomplete oxidized core, treated with a red wash. From an early level of Sub-period IB.

12. Ring stand of red ware with flaring sides having incised horizontal lines cut obliquely by vertical lines making a diamond pattern, of medium fabric, showing an oxidized core, treated with a red slip. From an early level of Sub-period IB.

13. Vase of red ware with an out-turned undercut clubbed rim, showing an oxidized core, with horizontal thick bands painted in black. From an early level of Sub-period IB.

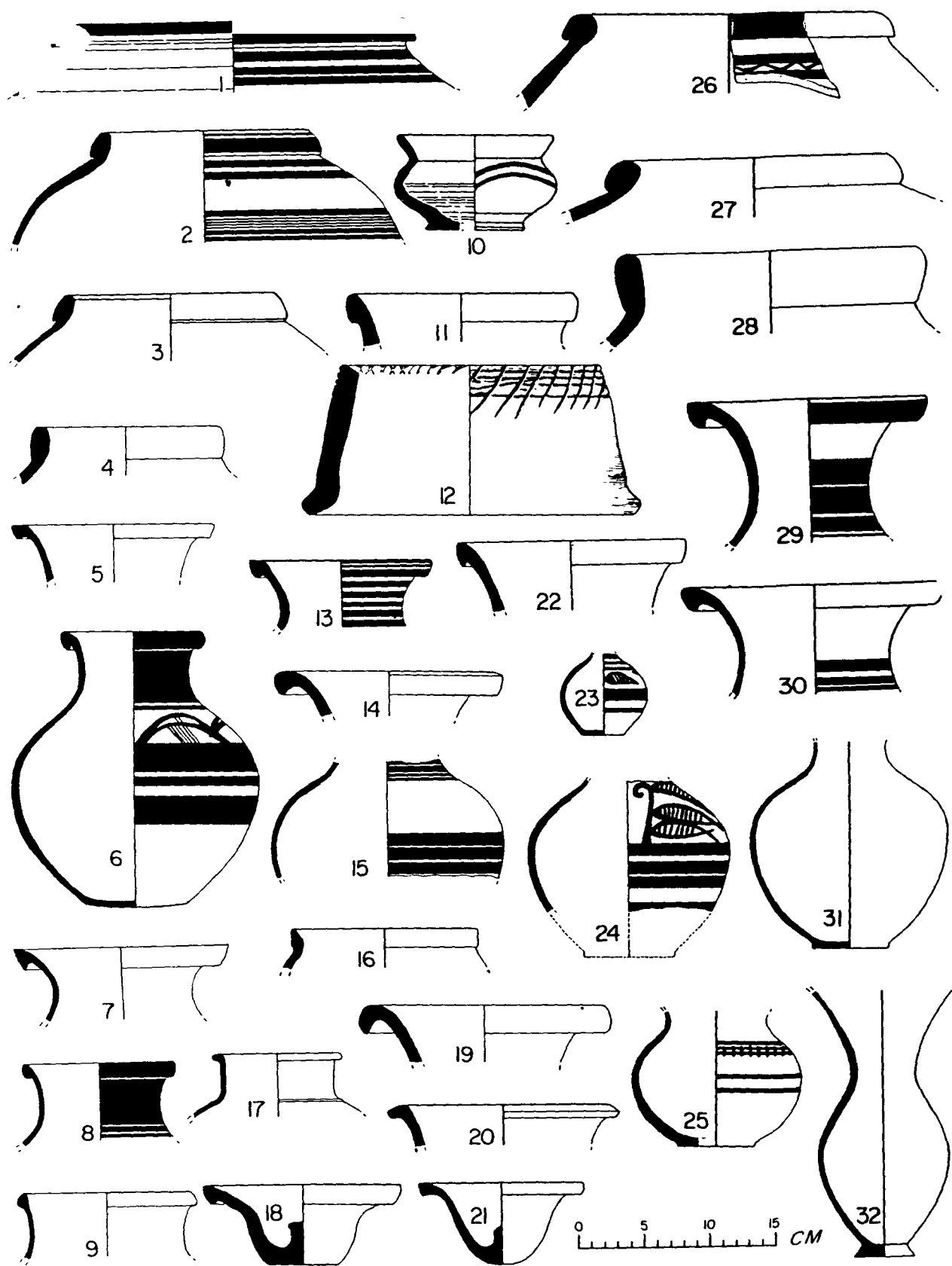


FIG.16 : Pottery of Sub-period IB

14. Vase of red ware with an out-turned thickened undercut rim, of medium fabric, showing an incomplete oxidized greyish core, treated with a red wash. From a late level of Sub-period IB.

15. Vase of red ware with a broken rim and globular body, decorated with horizontal bands in black, of medium fabric, showing an oxidized core, treated externally with a thick red slip. From an early level of Sub-period IB.

16. Vase of red ware with a collared rim, of medium fabric, showing an oxidized core, treated with a wash. From an early level of Sub-period IB.

17. Vase of red ware with an out-turned projected rim and straight neck, of coarse fabric, showing an incomplete oxidized greyish thin core, treated with a red wash. From a late level of Sub-period IB.

18. Shallow lid of red ware with an out-turned thickened undercut rim, with a central knob and flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

19. High necked jar of red ware with an out-turned flanged undercut rim, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IB.

20. Vase of red ware in buff colour with an out-turned flanged rim and tapering shoulder, of medium fabric, showing an oxidized core, treated with a self wash. From an early level of Sub-period IB.

21. Shallow lid of red ware with an out-turned projected rim, cylindrical knob and round base of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

22. Vase of red ware with an out-turned beaked rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

23. Miniature vase of red ware with a broken rim and globular body, decorated in black making a pattern of horizontal band and leaf like design, of medium fabric, showing an oxidized core, treated externally with a dark red slip. From a mid-level of Sub-period IB.

24. Vase of red ware with a broken rim and globular body painted in black making a pattern of horizontal bands and fish like leaves to a hook, of medium fabric, showing an oxidized core, treated externally with a red slip. From early level of Sub-period IB.

25. Vase of red ware with a broken rim and globular body painted in black making a horizontal ladder-like pattern and horizontal bands, of medium fabric, showing an oxidized core, treated externally with a red slip. From an early level of Sub-period IB.

26. Jar of red ware with a collared rim, having painted design of horizontal bands and wavy lines of medium fabric, showing highly oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

27. Jar of red ware with a collared rim, of medium fabric, showing an incomplete oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

28. Jar of red ware with a collared rim, and tapering shoulder, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.

29. High necked jar of red ware with an out-turned beaked undercut rim and concave neck, painted with thick horizontal band in black, of medium fabric, showing an oxidized core, treated externally with a red slip. From an early level of Sub-period IB.

30. Vase of red ware with an out-turned beaked undercut rim and concave neck and painted with thick and thin horizontal bands, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IB.

31. Vase of red ware with a broken rim spherical body and discular flat base, of fine fabric, showing complete oxidized thin core, treated with an ochre wash. From an early level of Sub-period IB.

32. Flask of red ware with broken rim, concave neck and bulbous body having flat base, of fine fabric, showing an oxidized core, treated with dark red slip on the exterior. From a late level of Sub-period IB.¹⁰

FIG.17

1. Dish of red ware with an out-turned thickened drooping rim, of coarse thick fabric, showing an oxidized thick core, treated with an ochre wash over husk impression on the surface. From an early-level of Sub-period IB.

2. Dish of red ware in an ochre colour with an out-turned projected rim and slight carinated shoulder, of thick fabric, showing an oxidized core, treated with a self wash. From an early level of Sub-period IB.

3. Dish of red ware with a clubbed rim and carinated shoulder, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

4. Dish of red ware with a projected rim and carinated shoulder, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

5. Basin of red ware with a sharpened and incurved rim with ridge on the base of exterior, of coarse fabric, showing an incomplete oxidized core, treated with a red wash. From a late level of Sub-period IB.

6. Dish of red ware with an undercut beaded rim, of medium fabric, showing an oxidized core, wet-smoothened, treated with an ochre wash. From an early level of Sub-period IB.

7. Dish of red ware with an undercut projected rim, of medium fabric, showing an oxidized core, treated with a dark brown slip. From an early level of Sub-period IB.

8. Basin of red ware with a beaded and externally grooved rim, of medium fabric, showing an oxidized core, treated externally with a red slip. From a late level of Sub-period IB.

9. Basin of red ware with an undercut beaded rim and straight sides, painted with black horizontal bands, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.

10. Basin of red with an out-turned beaded rim, of coarse fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

11. Basin of red ware with an inverted rim having a ridge in the exterior with grooves and incurved shoulder having parallel horizontal grooves, thin fabric, treated with a red wash. From late level of Sub-period IB.

12. Basin of red ware with an out-turned flanged rim, of coarse fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

¹⁰ The shape and slip of this flask is nearer to the type of flask illustrated in M.S. Vats, *Excavations at Harappa* (Delhi, 1940), pl. LXI H 132, M 62 a. This shape is also available from Ambkheri, M.N. Deshpande and K.N. Dikshit, *Op. cit.*, No. VII, p. 185, figure 35; Also see Mitathal II B; K.N. Dikshit, *Op. cit.*, pp. 256-269.

THE POTTERY

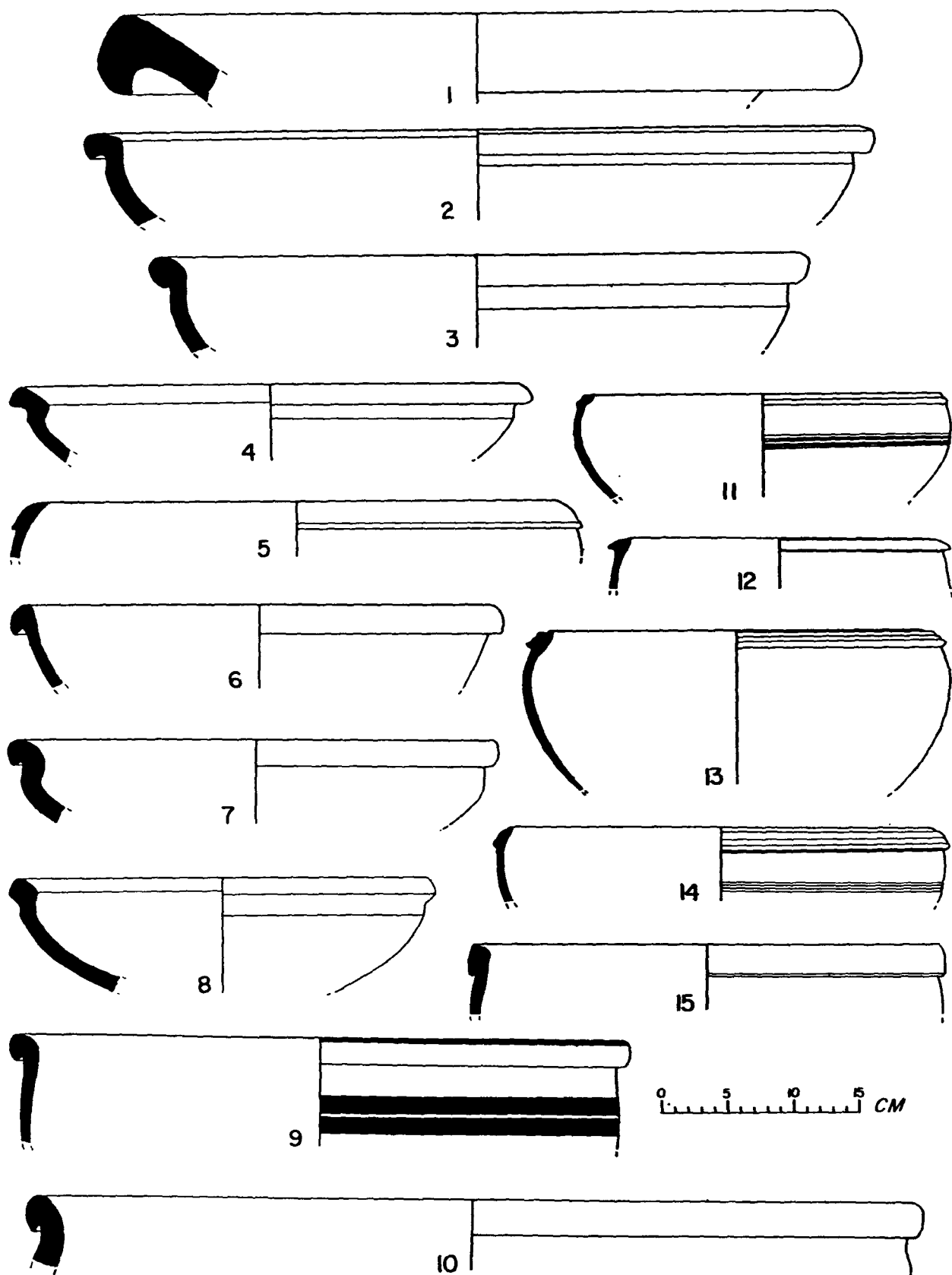


FIG.17 : Pottery of Sub-period IB

13. Basin of red ware with multiple grooved rim of coarse fabric, showing an incomplete, oxidized greyish core and surface treated with a red wash. From a late level of Sub-period IB.

14. Basin of red ware with an incurved sharpened rim with multiple grooves and horizontal grooves on shoulder, of medium fabric, showing an incomplete oxidized greyish core, treated externally with a red slip. From a late level of Sub-period IB.

15. Basin of red ware with a thickened rim and vertical shoulder, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

FIG. 18

1. Complete squat dish-on-stand of red ware with a projected rim and carinated shoulder of the dish and raised edge at the slightly splayed out base, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IB.¹¹

2. Fragment of a dish of red ware with a projected undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

3. Fragment of a dish of red ware with an out-turned projected undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

4. Fragment of a dish of red ware with an out-turned undercut flaring rim, of medium fabric, showing an oxidized core, treated with a thick red slip on the interior. From a late level of Sub-period IB.

5. Dish of dish-on-stand of red ware with flaring rim, of medium fabric, showing incomplete oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

6. Dish of red ware with an out-turned undercut rim, of medium fabric, showing an oxidized core, treated with a brown slip on the exterior and interior. From a mid-level of Sub-period IB.

7. Dish of red ware with a flaring undercut rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

8. Dish of red ware with flaring undercut rim, of fine thick fabric, showing an oxidized core, treated externally with a brown thick wash. From a late level of Sub-period IB.

9. Dish of red ware in an ochre colour with a flaring undercut rim, of fine fabric, showing an oxidized core, treated with a self wash. From an early level of Sub-period IB.

10. Dish of red ware with an out-turned flaring undercut rim, of thick fabric, showing an oxidized core, treated externally with a brown slip. From a mid-level of Sub-period IB.

11. Dish of red ware with an out-turned thickened flaring rim and carinated shoulder, of medium fabric, showing oxidized core, treated internally with a brown slip. From a late level of Sub-period IB.

13. Dish of red ware with a flaring undercut rim, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

14. Dish of red ware with prominent flanged undercut rim, of medium fabric, showing an oxidized core, treated externally with an ochre slip. From an early level of Sub-period IB.

¹¹ Cf. Bahadarabad, *Op. cit.*, fig. 13.1; Bara fig. 15.1; Ambakheri, *Op. cit.*, fig. 6.68a.

THE POTTERY

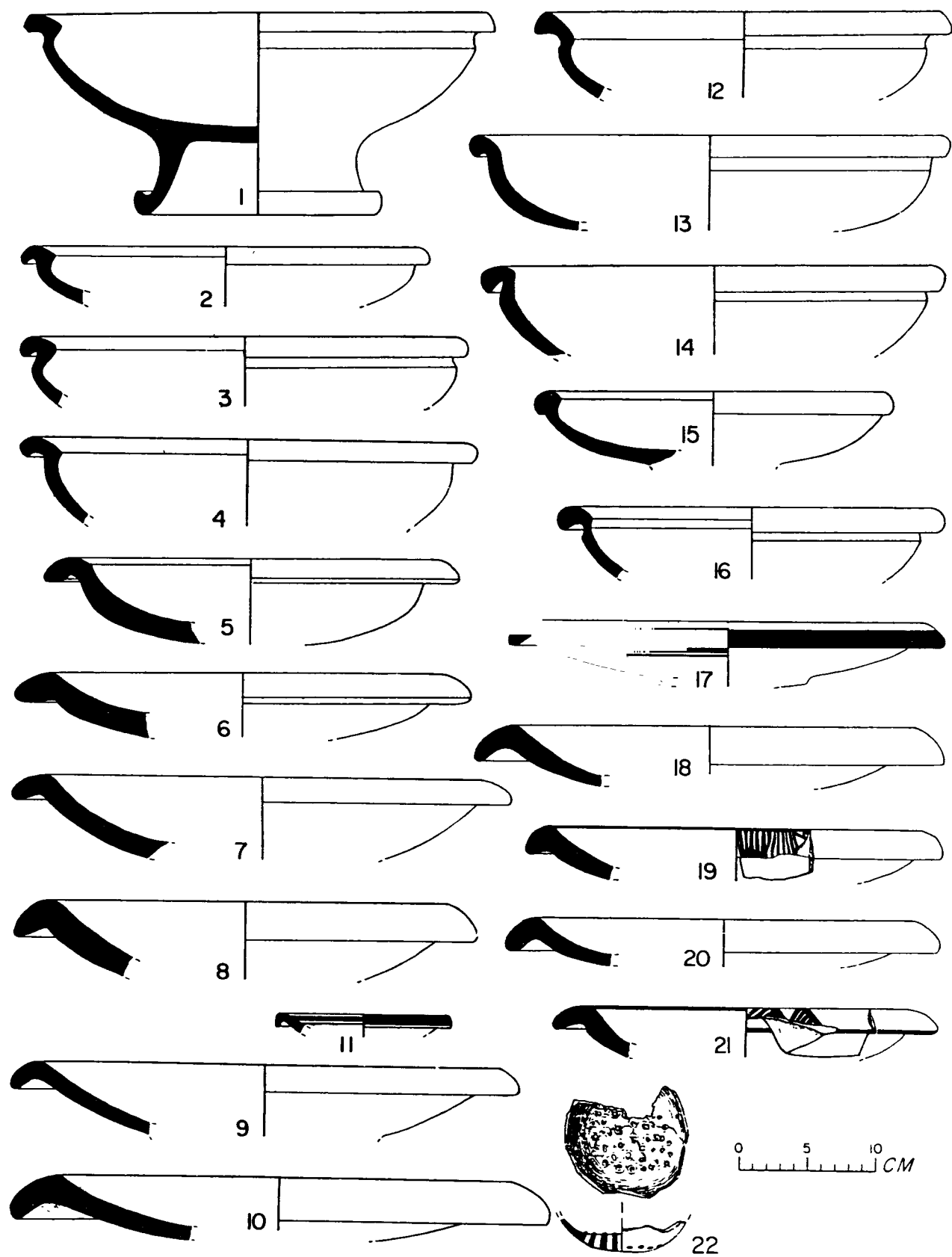


FIG.18 : Pottery of Sub-period IB

15. Dish of red ware with a nail-head undercut rim, of medium fabric, showing well oxidized core, treated with a brown wash. From a late level of Sub-period IB.

16. Dish of red ware with an out-turned thickened flanged undercut rim, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.

17. Dish of a dish-on-stand of red ware with a flaring undercut rim, painted in black colour having horizontal bands, of medium fabric, showing an oxidized core, treated internally with a brown slip. From a mid-level of Sub-period IB.

18. Dish of red ware with a flaring undercut rim, of medium fabric, showing an oxidized core, treated externally with a brown slip. From an early level of Sub-period IB.

19. Dish of red ware with an out-turned thickened undercut rim, painted in black with vertical lines, of coarse fabric, showing an oxidized core, treated with a brown thick wash. From a mid-level of Sub-period IB.

20. Dish of red ware in ochre colour with an out-turned flaring undercut rim, of medium fabric, showing unoxidized core, treated internally with a brown slip. From an early level of Sub-period IB.

21. Dish of red ware with a flaring undercut rim, painted in black having triangles filled with oblique lines, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.

22. Basal portion of a cylindrical perforated jar of red ware. From a mid-level of Sub-period IB.

FIG. 19

1. Dish of a dish-on-stand of red ware with a long drooping incurved rim, painted in black making a pattern of triangles filled with vertical lines and circles externally and horizontal bands internally, of medium fabric, showing well oxidized core, treated with a dark slip. From an early level of Sub-period IB.

2. Dish of a dish-on-stand of red ware with a long drooping incurved grooved rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

3. Dish of a dish-on-stand of red ware with a short drooping rim, of medium fabric, showing incomplete oxidized core, treated with a wash. From a mid-level of Sub-period IB.

4. Dish of a dish-on-stand of red ware with a short drooping rim, of medium fabric, showing incomplete oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.

5. Fragment of a dish-on-stand of red ware with a raised edge on the convex base, hand made having husk marks on the surface, of coarse fabric, showing incomplete oxidized core, treated with an ochre wash. From surface.

6. Hollow stand of a dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.

7. Stand of a dish-on-stand of red ware with an out-turned raised edge on the slightly convex base, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.

THE POTTERY

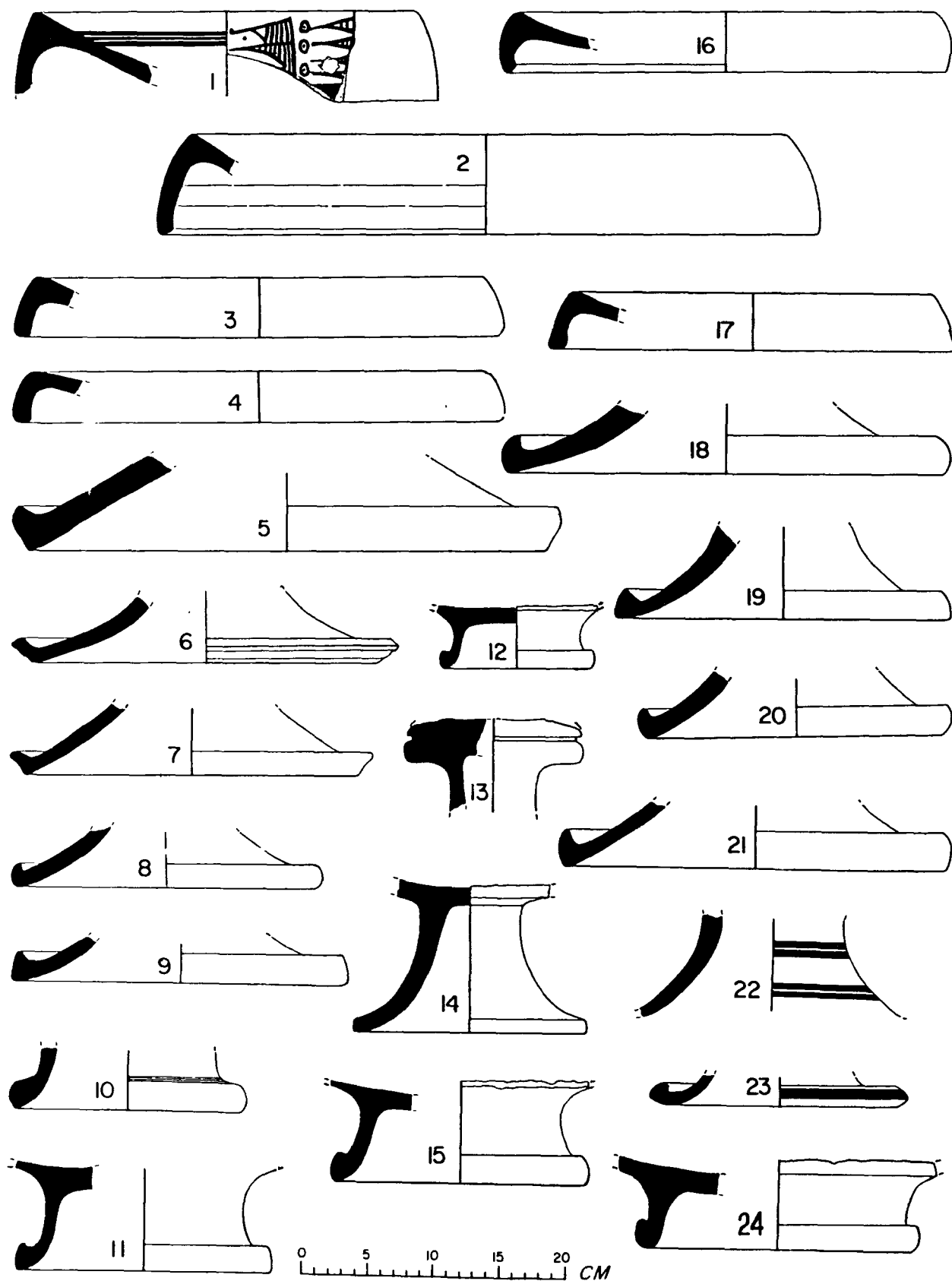


FIG. 19 : Pottery of Sub-period IB

8. Stand of dish-on stand of red ware with a raised edge on the convex base, of medium fabric, showing well oxidized core, treated with a brown slip. From a mid-level of Sub-period IB.
9. Stand of a dish-on-stand of red ware in ochre colour with a raised edge on the convex base, of medium fabric, showing an oxidized core, treated with a self wash. From a late level of Sub-period IB.
10. Fragment of stand of a dish-on-stand in red ware with a raised edge on the hollow base, of medium fabric, showing oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.
11. Stand of a squat dish-on-stand of red ware with a raised edge on the hollow base, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.
12. Stand of a squat dish-on-stand of red ware with a slightly raised edge on the hollow base, of coarse fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.
13. Fragment of a dish-on-stand of red ware with one deep groove, evidence of luting between the base of the dish and the stem available, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.
14. Stand of a dish-on-stand of red ware with a splayed base, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IB.
15. Stand of a squat dish-on-stand of red ware with a raised edge on the base, of medium fabric, showing well oxidized core, treated with a brown wash. From a late level of Sub-period IB.
16. Dish of a dish-on-stand of red ware with short drooping rim, of medium fabric, showing unoxidized core, treated with an ochre wash. From an early level of Sub-period IB.
18. Stand of a dish-on-stand of red ware with a raised ridge on the splayed out base, of coarse fabric, showing an oxidized smoky core, treated with a brown wash. From a mid-level of Sub-period IB.
19. Stand of a dish-on-stand of red ware in ochre colour, with a raised ridge on the splayed out base, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.
20. Stand of a dish-on-stand of red ware with a raised ridge on the splayed out base, of medium fabric, showing well oxidized core, treated with a thick brown wash. From a mid-level of Sub-period IB.
21. Stand of a dish-on-stand of red ware in ochre colour with a raised ridge on the splayed out base, of medium fabric, showing incomplete oxidized core, treated with a self wash. From a mid-level of Sub-period IB.
22. Fragment of a stem of a dish-on-stand of red ware with concave sides, painted in black having sets of horizontal parallel bands, of medium fabric, showing an oxidized core, treated with a brown wash. From a late level of Sub-period IB.
23. Stand of a dish-on-stand of red ware with a raised edge on the splayed out base painted with a thick black band, of medium fabric, showing an oxidized core, treated with a brown wash. From surface.
24. Stand of a squat dish-on-stand of red ware with a raised edge of thickened base, of medium fabric, showing well oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

FIG. 20

1. Vase of red ware with an out-turned nail-headed rim, concave neck and broken shoulder, of medium fabric, showing an incomplete oxidized smoky core, treated with a red slip. From a late level of Sub-period IB.

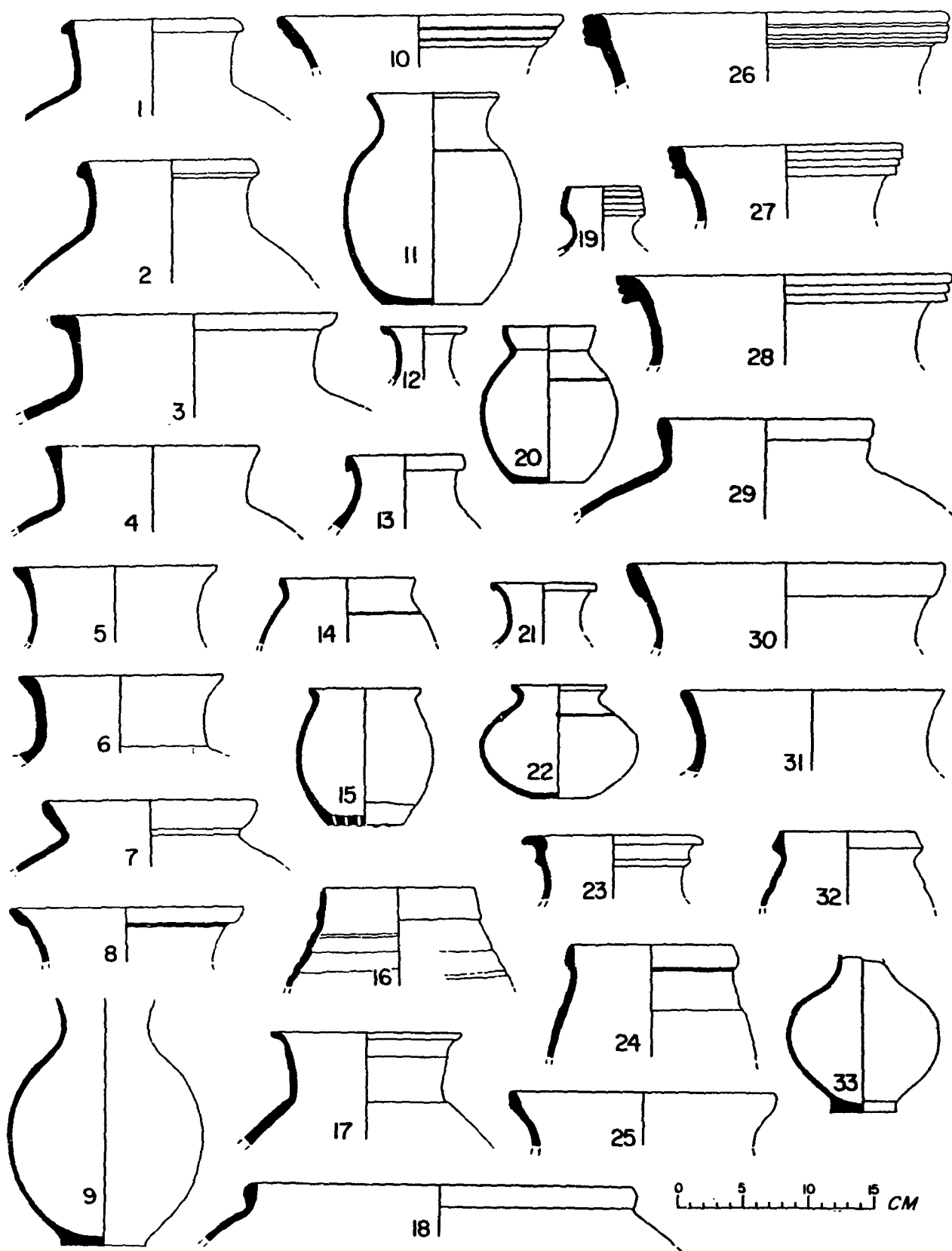


FIG. 20: Pottery of Sub-period IB

2. Vase of red ware with an externally thickened rim concave neck and oblique shoulder, globular body, of medium fabric, showing an oxidized core, treated externally with a red wash. From a late level of Sub-period IB.

3. Vase of red ware with an out-turned projected rim and concave neck, of medium fabric, showing an incomplete oxidized smoky core, treated with a red wash. From a late level of Sub-period IB.

4. Vase of red ware with a thickened featureless rim, vertical neck, of coarse fabric, showing an unoxidized core, treated with a light cream wash. From a late level of Sub-period IB.

5. Vase of red ware with an externally splayed out rim and concave neck, of coarse fabric, showing an unoxidized core, treated with a red wash. From a mid-level of Sub-period IB.

6. Vase of red ware with an externally splayed out rim and convex shoulder, of medium fabric, an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

7. Vase of red ware with slightly out-turned rim and oblique shoulder, of coarse fabric, showing an incomplete oxidized smoky core and surface. From a late level of Sub-period IB.

8. Vase of red ware with a thickened collared rim and concave neck, of coarse fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

9. Vase of red ware with a broken rim, concave neck, globular body and footed flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

10. Vase of red ware with a splayed out featureless externally grooved rim, of medium fabric, showing an oxidized core, treated with a pinkish slip. From a late level of Sub-period IB.

11. Vase of red ware with an externally out-turned featureless rim, concave neck showing grooved lines and globular body having flat base, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

12. Miniature vase of red ware with an out-turned thickened rim and concave neck, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

13. Vase of red ware with a thickened beaded rim and concave neck, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

14. Vase of red ware with a thickened featureless rim and oblique shoulder having grooves, globular body, of medium fabric, showing an oxidized core, treated with a brown wash. From a late level of Sub-period IB.

15. Miniature vase of red ware with a splayed out featureless rim, concave neck, ovoid profiled body and flat base having perforations on the base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

16. Vase of red ware with featureless rim, oblique shoulders having ridges, of medium fabric, showing well oxidized core, treated with a brown wash. From a late level of Sub-period IB.

17. Vase of red ware with an externally splayed out rim, slightly concave neck and oblique shoulders having grooves, of medium fabric, showing an oxidized core, treated with a brown wash. From a late level of Sub-period IB.

18. Vase of red ware with a thickened beaded rim and oblique shoulders having grooves, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

19. Vase of red ware with a featureless grooved rim and concave neck, of medium fabric, showing incomplete oxidized smoky core, treated with a red wash. From a late level of Sub-period IB.

20. Vase of red ware with an inturned featureless rim, globular body having grooves and flat-base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

21. Vase of red ware with a beaded rim and concave neck, of medium fabric, showing an oxidized core, treated with an ochre wash. From an early level of Sub-period IB.

22. Miniature vase of red ware with an externally splayed out rim, globular body having four holes on the shoulder and groove, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.

23. Vase of red ware with an out-turned flanged rim, having a ridge and concave neck, of medium fabric, showing incomplete oxidized smoky core, treated with a red wash. From a late level of Sub-period IB.

24. Vase of red ware with a vertical featureless rim, oblique shoulder having grooves, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

25. Vase of red ware with a thickened featureless rim and concave neck, of medium fabric, showing an oxidized core, treated with a red wash. From an unstratified level.

26. Vase of red ware with an externally thickened rim having deep grooves and oblique shoulder, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

27. Variant of 26.

28. Vase of red ware with a deep grooved rim and convex shoulder, of medium fabric, showing incomplete oxidized core, treated with a bright brown wash. From a late level of Sub-period IB.

29. Vase of red ware with a vertical featureless grooved rim and a globular body, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.

30. Vase of red ware with a thickened splayed out featureless rim and concave neck, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

31. Vase of red ware with a featureless rim and concave neck, of coarse fabric, showing incomplete oxidized smoky core and surface, treated with a red slip. From a late level of Sub-period IB.

32. Vase of red ware with an externally sharpened rim and with a prominent external rib, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

33. Miniature vase of red ware with a broken rim, concave neck and globular body and footed base, of medium fabric, showing an oxidized core, treated with an ochre wash. From a late level of Sub-period IB.

FIG. 21

1. Basin of red ware with an incurved externally elliptical collared rim with a raised edge on the neck, of medium fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IB.

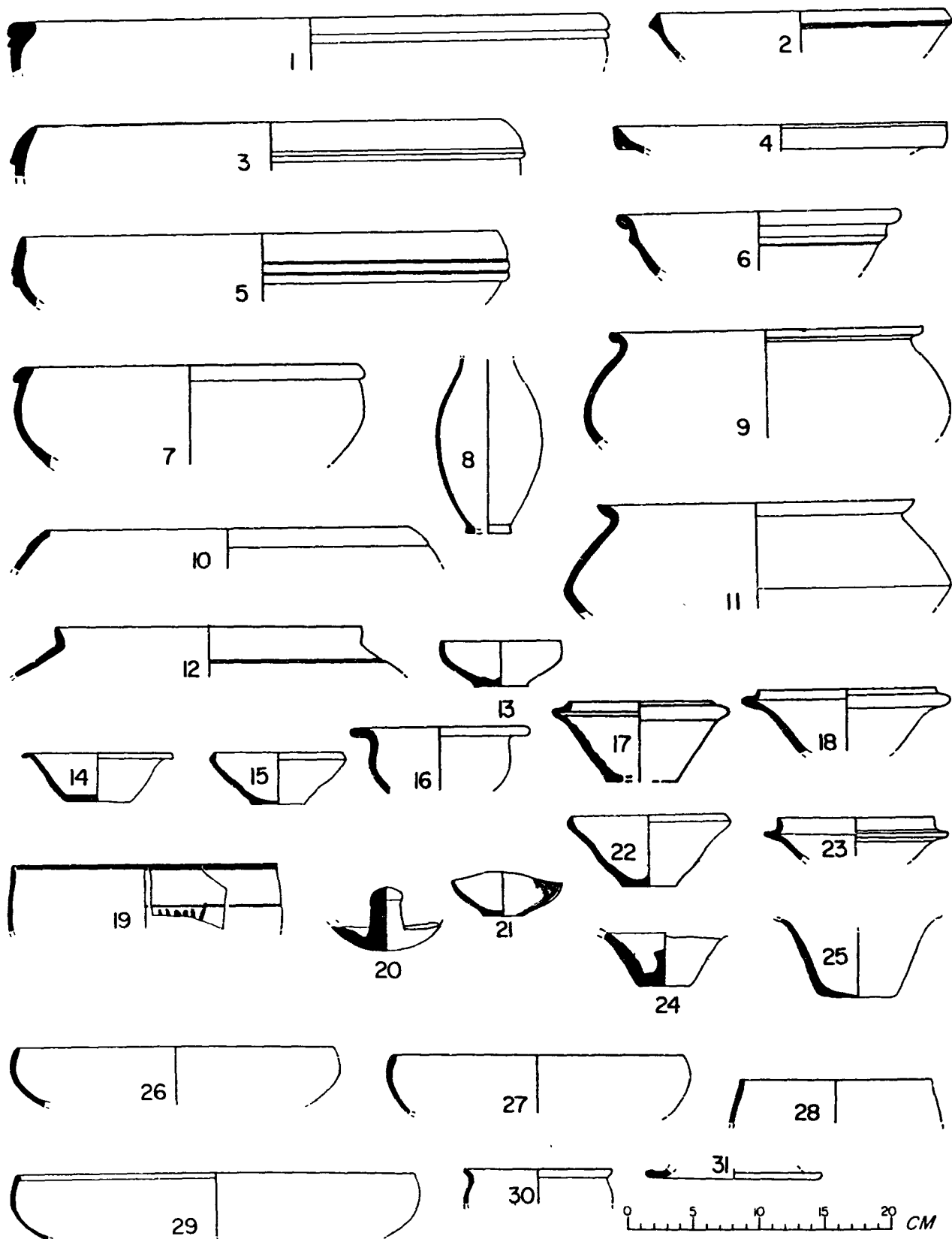


FIG. 21 : Pottery of Sub-period IB

2. Bowl of red ware with an out-turned obliquely cut rim and tapering side, having grooves on the exterior, of fine thin fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IB.

3. Basin of red ware with an out-turned thickened collared rim, of medium fabric, showing incomplete oxidized greyish core, treated with a cream slip. From a late level of Sub-period IB.

4. Bowl of red ware with an out-turned rim, of medium fabric, showing an oxidized core, treated with a cream slip. From a late level of Sub-period IB.

5. Basin of red ware with an incurved and externally ridged rim, of coarse fabric, treated with a red wash. From a late level of Sub-period IB.

6. Bowl of red ware with an out-turned beaded rim and carinated neck, of medium fabric, showing an incomplete oxidized core. From a mid-level of Sub-period IB.

7. Bowl of red ware with an externally collared rim, of medium fabric, showing an incomplete oxidized greyish core. From a late level of Sub-period IB.

8. Broken vase of red ware with an oval profile and footed base, of medium fabric, having an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

9. *Handi* of red ware with an out-turned flanged rim and convex profiled body, of medium fabric, showing an oxidized core, treated with a slip. From a late level of Sub-period IB.

10. Big jar of red ware with a wide mouth, slightly thickened rim and tapering shoulder, of medium fabric, showing an incomplete oxidized greyish core. From a late level of Sub-period IB.

11. *Handi* of red ware with an externally flanged rim and carinated body, of coarse fabric, showing an unoxidized grey core, treated with a red wash. From a mid-level of Sub-period IB.

12. Jar of red ware with a slightly out-turned rim and tapering sides having a groove, of medium fabric, treated with a red slip. From a late level of Sub-period IB.

13. Bowl of red ware with a featureless rim and footed base, of fine thin fabric, showing an oxidized core, treated with a cream slip. From a late level of Sub-period IB.

14. Bowl of red ware with an out-turned everted rim and flat base, of medium fabric, showing an incomplete oxidized greyish core. From a mid-level of Sub-period IB.

15. Deep bowl with an internally everted rim tapering sides and footed base, of medium fabric, showing an oxidized core, treated with a red slip. From a late level of Sub-period IB.

16. Bowl-cum-lid of red ware with an out-turned flaring rim and slightly carinated shoulder, of medium fabric, showing an oxidized core, externally treated with a brown slip. From an early level of Sub-period IB.

17. Lid-cum-bowl of red ware with an incurved rim, thickened tapering sides and disc base, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.

18. Lid-cum-bowl of red ware with an internally folded undercut flanged rim, of medium fabric, showing an oxidized core, treated with a buff slip. From a late level of Sub-period IB.

19. Bowl of grey ware with a featureless rim, straight sides, painted in black externally showing a group of oblique lines, which has peeled off, of fine fabric, not fully baked, has blotches of red and grey. From an early level of Sub-period IB.

20. Deep lid of red ware having a central cylindrical knob with a domical top, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.¹²
21. Lamp of red ware with a featureless rim and flat base, of medium fabric, showing an oxidized core having smoke marks showing its use, treated with a red wash. From a mid-level of Sub-period IB.
22. Deep bowl of red ware with an incurved rim and flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.
23. Bowl of red ware with a folded incurved undercut flanged rim, of medium fabric, showing an oxidized core, treated with a red wash. From a late of Sub-period IB.
24. Lid of red ware with centrally placed flat knob, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.
25. Bowl of red ware with a broken rim slightly tapering sides and flat base, of medium fabric, showing an oxidized core, treated with a cream wash. From a late level of Sub-period IB.
26. Bowl of black ware with featureless rim and convex sides, of fine thin fabric, showing an oxidized core, externally treated with a black slip. From a mid-level of Sub-period IB.
27. Bowl of black ware with a thickened featureless rim and convex sides, of medium fabric, showing an oxidized core, treated with a black slip. From a mid-level of Sub-period IB.
28. Bowl of grey ware with featureless rim and straight sides, of fine thin fabric, showing an oxidized core, treated with a dark grey slip. From a late level of Sub-period IB.
29. Bowl of steel grey colour in grey ware with featureless rim and convex sides of fine fabric, showing an oxidized core. From an early level of Sub-period IB.
30. Bowl of dark grey colour in grey ware with an externally splayed out rim and slightly concave sides, of medium fabric, showing an oxidized core, treated with a black slip. From a mid-level of Sub-period IB.
31. Base of a dish-on-stand in grey ware with a raised edge, treated with a dark grey slip, of fine thin fabric, showing an oxidized core. From a late level of Sub-period IB.

FIG. 22

1. Miniature bowl of red ware with an internally turned thin flanged rim, tapering shoulder and disc flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.
2. Miniature deep bowl of red ware with an incurved featureless rim and disc flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a mid-level of Sub-period IB.
3. Lamp of red ware with a thickened featureless rim, slightly convex sides and flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.
4. Shallow bowl-cum-lid of red ware with featureless rim, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.
5. Miniature dish of red ware with an externally flaring rim and a flat base having a perforation

¹² Cf. Bahadarabad, *Op.cit.*, Fig. 13, 6A.

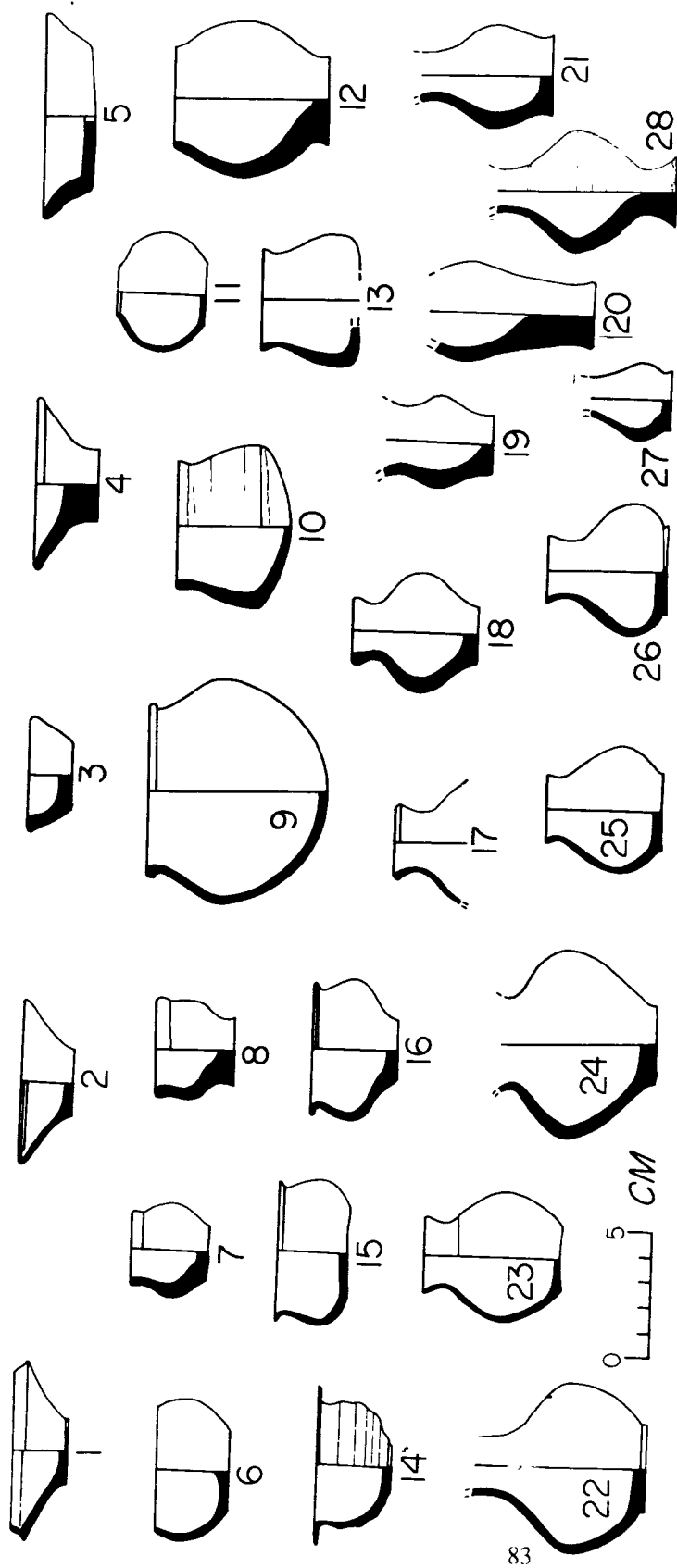


FIG. 22: Pottery of Sub-period 1A and 1B

in the centre, of medium fabric, showing an oxidized core, treated with a red wash. From an early level of Sub-period IB.

6. Miniature deep bowl of red ware with a thin featureless rim, concave sides and disc flat base, of fine fabric, showing a well oxidized core, treated externally with a red slip. From a mid-level of Sub-period IB.

7. Miniature vase of red ware with a slightly thickened out-turned rim, globular body and flat disc base, of medium fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IB.

8. Miniature cup of red ware with a thickened featureless rim, and flat base, of medium fabric, showing an incomplete oxidized core, treated externally with a red slip. From a mid-level of Sub-period IB.

9. Miniature jar of red ware with an externally out-turned rim, oblique neck and spherical body and round base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

10. Miniature jar of red ware with a thickened featureless rim, spherical and concave base, of fine fabric, showing incomplete oxidized grey core, treated with an ochre wash. From a late level of Sub-period IB.

11. Miniature pot of red ware with a broken rim, globular body and flat base, of medium fabric, showing an oxidized core, treated with a cream wash. From a late level of Sub-period IB.

12. Miniature pot of red ware with a broken rim, globular body and flat base, of medium fabric, showing an oxidized core, treated with a cream wash. From a late level of Sub-period IB.

13. Miniature vase of red ware with with an externally curved rim, spherical body and flat base, of medium fabric, showing an incomplete oxidized grey core, treated with a red wash. From a late level of Sub-period IB.

14. Miniature deep bowl-cum-lid of red ware with an externally splayed out flanged rim having grooves in the body and the disc base, of fine fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

15. Miniature bowl of red ware with an externally out-turned rim concave neck and flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

16. Miniature jar of red ware with an externally splayed out-rim, disc base, of medium fabric, showing an incomplete oxidized grey core, externally treated with a brown slip. From a late level of Sub-period IB.

17. Miniature vase of red ware with an externally out curved featureless rim concave neck and oblique shoulders, of fine fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

18. Miniature vase of red ware with an externally thickened featureless rim, concave neck and globular body, of medium fabric, showing an incomplete oxidized grey core, treated with a red wash. From a late level of Sub-period IB.

19. Miniature vase of red ware with a broken rim and flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

20. Fragment of goblet in red ware with a flaring shoulders and flat base, of thin fabric, showing an unoxidized core, treated with a brown wash. From a mid-level of Sub-period IB.

21. Miniature vase of red ware with a broken concave neck, spherical body and flat base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

22. Miniature vase of grey ware with a broken rim concave neck, globular body and discular flat base, of fine fabric, showing an oxidized smoky core, treated with a grey wash. From a late level of Sub-period IB.

23. Miniature vase of red ware with an externally out-turned featureless rim, concave neck having grooves on the shoulder, spherical body and flat disc base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

24. Miniature vase of red ware with a broken rim concave neck, body with convex profile, disc base, of medium fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

25. Miniature vase of red ware with an out-turned featureless rim, globular body with flat base, of fine fabric, showing well oxidized core, treated with a self-slip. From an early level of Sub-period IB.

26. Miniature vase of red ware with featureless rim, concave neck, globular body and flat disc base, of fine thin fabric, showing an oxidized core, treated with a red wash. From a late level of Sub-period IB.

27. Miniature vase of red ware with featureless rim, pear shaped body profile, flat disc base, of fine thin fabric, hand made, with a light slip. From a mid-level of Sub-period IB.

28. Miniature vase of red ware with a broken rim, convex body and disc base, of fine fabric, showing an oxidized core, treated with a cream wash. From an early level of Sub-period IA.

FIG. 23; PLS. XIV-XV AND A—B

1. Fragment of a jar of red ware with an externally thickened collared rim, incised notch with pattern below painted in black with a thick horizontal band and double wavy lines, of fine fabric, showing an oxidized core, treated with ochrous slip. From a late level of Sub-period IB.

2. Fragment of a jar in red ware painted in black in two panels with fish-like pattern on one side divided by vertical zigzag lines within two vertical bands and the other side adorned with a group of oblique lines cut by horizontal lines, of fine fabric, showing an oxidized core, treated with a red slip. From an early level of Sub-period IB.

3. Fragment of a jar of red ware painted in black with check-pattern, of fine fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IB.

4. Fragmentary sherd of a jar of red ware painted in black with leaves on branches in oblique groups, of fine fabric, showing an oxidized core, treated with a brown wash. From a late level of Sub-period IB.

5. Fragment of a jar of red ware painted in black with thick band and a group of regular branches with leaves in an arched fashion, of fine fabric, showing an oxidized core, treated with a bright brown slip. From a late level of Sub-period IA.

6. Fragmentary sherd of a jar of red ware painted in black with branches having slightly folded leaves along with a flower or fruit like object hooked to branches, of fine fabric, having an oxidized core, treated with a dark brown slip. From an early level of Sub-period IA.

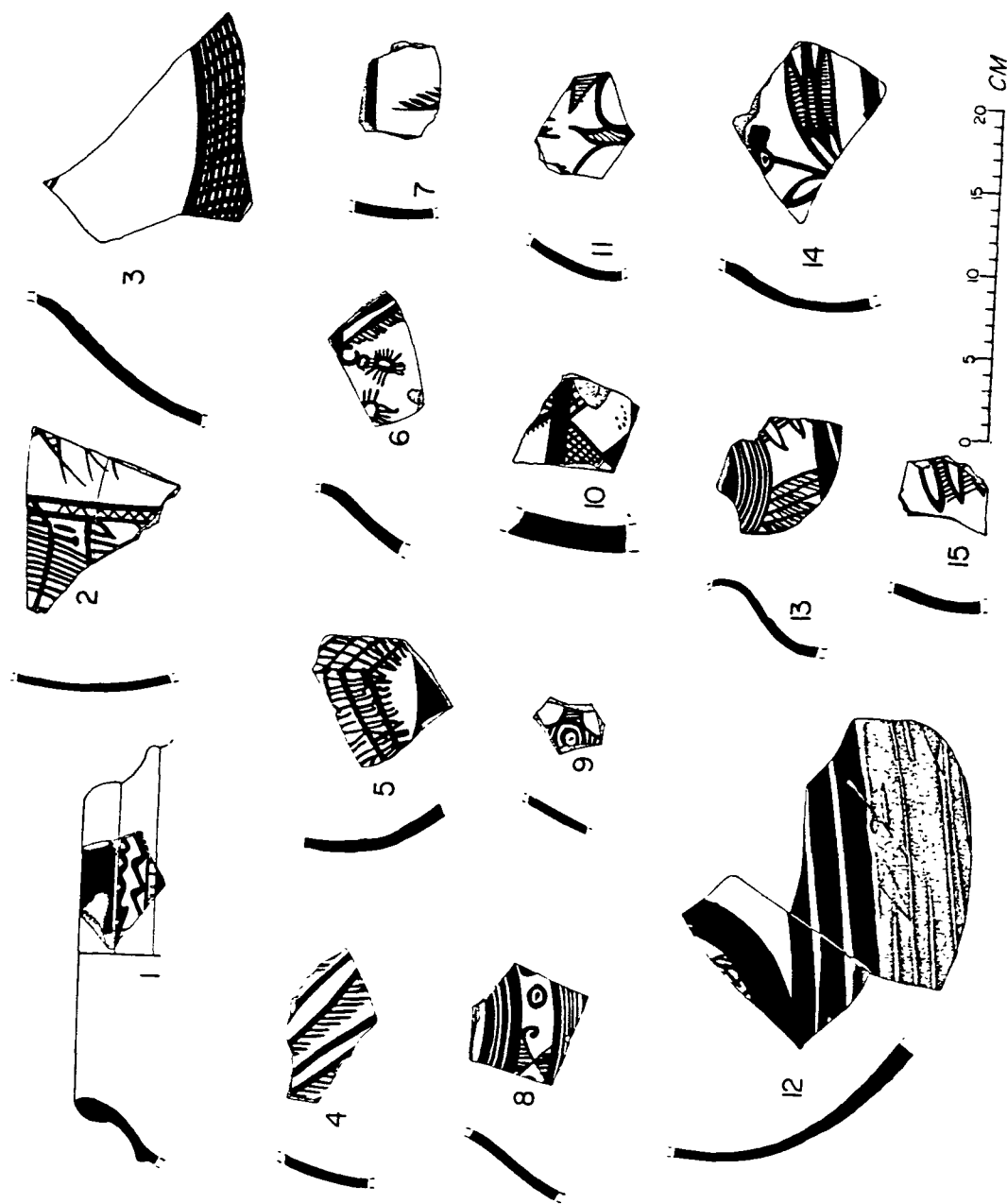


FIG. 23: Painted red ware, Sub-period IA and IB

THE POTTERY

7. Fragmentary sherd of a jar of red ware painted in black with horizontal band and a tree branch with leaves, of fine fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.

8. Fragmentary sherd of a jar of red ware painted in black with opposite hooked triangles filled with vertical slashes and circles with a dot panelled in groups of horizontal thick and thin bands, of fine fabric, showing an oxidized core, treated with a bright ochrous slip. From a mid-level of Sub-period IA.

9. Fragmentary sherd of a jar in red ware painted in black with double circles with a dot in the centre enclosed by stylized leaves (?), of fine fabric, showing an oxidized core, treated with a dark brown wash. From a late level of Sub-period IB.

10. Fragment of a jar of red ware painted in black with a horizontal band below which opposite triangles filled with checker-pattern and stylized leaves and empty space showing six irregular dots, of medium fabric, showing an oxidized core, treated with a bright red slip. From an early level of Sub-period IA.

11. Fragmentary sherd of a jar of red ware painted in black with stylised branches with leaves filled with lines, of fine fabric, showing an oxidized core, treated with a brown slip. From an early level of Sub-period IB.

12. Fragment of a big jar of red ware painted in black with three horizontal thick bands and one curved thick band having branches (?), showing a rusticated surface on the lower portion, of medium fabric, showing an oxidized core, treated with a bright red slip. From a mid-level of Sub-period IA.

13. Fragment of a jar of red ware painted in black with thick and thin bands panelled with stylized oblique branches with leaves on one side and well drawn leaves on the other, of fine fabric, and core oxidized. From a mid-level of Sub-period IB.

14. Fragment of a jar of red ware painted in black with a horizontal band and different types of stylised leaves on both the sides of a branch with flower emanating from it, medium fabric, showing an oxidized core, treated with a brown slip. From a late level of Sub-period IB.

15. Fragmentary sherd of a jar of red ware, painted with a group of leaves, space in between filled by oblique lines, of medium fabric, showing an oxidized core, treated with a self-wash. From a late level of Sub-period IB.

FIG. 24; PLS. XVI-XVII AND C-D

1. Fragmentary sherd of the body of a jar of red ware painted in black with a thick band and three stylized leaf like pattern joined with a curved band, of medium fabric, showing an oxidized core, treated with a brown slip. From an early level of Sub-period IB.

2. Fragmentary sherd of a jar of red ware painted in black with regular thick and thin bands horizontally having continuous triangles in three rows in between, of fine fabric with an oxidized core, treated with a brown slip. From a mid-level of Sub-period IB

3. Fragment of a jar in red ware painted in black with regular thick horizontal bands and wavy lines in between, of medium fabric, showing an oxidized core, treated with a light brown slip. From a mid-level of Sub-period IB.



FIG. 24: Painted Red Ware, Sub-period IB

4. Fragmentary sherd of red ware painted in black with horizontal thick bands and a panel of triangles in between, of medium fabric, showing an oxidized core, treated with a dark brown slip. From a mid-level of Sub-period IB.

5. Fragment of a jar of red ware painted in black with thick horizontal bands and stylized leaf-pattern with loops, of medium fabric, showing an oxidized core, treated with a slip. From a late level of Sub-period IB.

6. Neck portion of a vase of red ware painted in black with regular horizontal bands and stylized leaf-pattern, of medium fabric, showing an oxidized core, treated with a dark brown slip. From a late level of Sub-period IB.

7. Sherd of a jar of red ware painted in black with thick horizontal bands and stylized leaf motif, of medium fabric, showing an incomplete oxidized greyish core, treated with a dark brown slip. From a mid-level of Sub-period IB.

8. Fragment of a jar in red ware painted in black with a group of stylized leaves, of fine fabric, showing an oxidized core, treated with a brown slip. From a late level of Sub-period IB.

9. Fragment of a jar in red ware painted in black with a pattern of horizontal bands and in between within the groups of vertical lines opposite triangles filled with vertical lines, of fine fabric, showing well oxidized core, treated with a bright red slip. From a mid-level of Sub-period IB.

10. Fragmentary sherd of a jar of red ware painted in black with a group of vertical lines and stylized leaves horizontally on both sides, of fine fabric, showing a well oxidized core, treated with a chocolate slip. From a late level of Sub-period IB.

11. Fragmentary sherd of a jar of red ware painted in black with an indeterminate motif, of medium fabric, showing an oxidized core, treated with a self slip. From a mid-level of Sub-period IB.

12. Vase of red ware with a beaked undercut rim and concave side, painted in black externally with horizontal bands, of medium fabric, showing an oxidized core, treated with an ochrous wash. From a late level of Sub-period IB.

13. Fragmentary sherd of a jar of red ware painted in black with a group of horizontal bands and roughly latticed diamonds formed by continuous loops, of fine fabric, showing an oxidized core, treated with a dark brown slip. From a late level of Sub-period IB.

14. Fragment of a jar of red ware painted in black with a peacock (?) and a portion of a leaf, of medium fabric, with an oxidized core, treated with a brown slip. From a late level of Sub-period IB.

15. Fragmentary sherd of a jar of red ware painted in black with stylized leaf-pattern in two oblique rows, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IB.

16. Fragmentary sherd of a jar of red ware painted in black with horizontal bands and stylized leaves, of fine fabric, showing a well oxidized core, treated with a bright red slip. From an early level of Sub-period IB.

17. Fragmentary sherd of a jar of red ware painted in black with regular thick and thin horizontal bands panelled by wavy lines, of fine fabric, showing well oxidized core, treated with a bright red slip. From a mid-level of Sub-period IB.

18. Body portion of a jar of red ware painted in black with thick horizontal bands and branches with leaves, of medium fabric, showing an oxidized core, treated with a brown slip. From an early level of Sub-period IB.

19. Fragment of a jar of red ware with a very thick band in black, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IB.

20. Fragment of a jar of red ware painted in black with thick bands, of the fine fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IB.

21. Fragment of jar of red ware painted in black with thick bands, of the fine fabric, showing well oxidized core, treated with a brown slip. From a mid-level of Sub-period IB.

22. Fragment of a jar of red ware painted in black with thick and thin bands, panelled by oblique lines, of medium fabric, showing an oxidized core, treated with a buffish slip. From a mid-level of Sub-period IB.

23. Fragment of a jar of red ware painted in black with horizontal bands having overhanging latticed arches, of medium fabric, showing an oxidized core, treated with ochrous wash. From a mid-level of Sub-period IB.

24. Fragment of a jar of red ware painted in black with a bunch of upside down twigs with a knot, of fine fabric, showing well oxidized core, treated with a dark brown slip. From a late level of Sub-period IB.

25. Fragment of a jar of red ware painted in black with thick and thin bands horizontally below which branches with stylized filled leaves are shown, of medium fabric, showing well oxidized core, treated with a red slip. From an early level of Sub-period IB.

FIG. 25; PLS. XVIII-XIX AND E-F

1. Fragment of shoulder, of a jar of red ware with incised pattern in the exterior having a group of oblique lines cut by horizontal lines, lower surface is rusticated, of medium fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IB.

2. Fragmentary shoulder part of a jar of red ware with incised lozenges above five horizontal deep lines in the exterior, of fine fabric, showing an oxidized core, treated with a buffish slip. From a mid-level of Sub-period IB.

3. Fragment of a shoulder, of a jar of red ware with incised vertical lines cut by horizontal lines making a pattern of groups of ladders in the exterior, of fine fabric, showing a well oxidized core, treated with a light brown slip. From a mid-level of Sub-period IA.

4. Fragment of a shoulder, of a jar of red ware with an applique rope design on the exterior, of medium fabric, with a semi-oxidized core, treated with a red slip. From a late level of Sub-period IB.

5. Fragment of a shoulder, of a jar of red ware with an incised stylized pattern of horizontal lines cut by curved lines ending into a conical end in the exterior, of fine fabric, showing well oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

6. Shoulder part of a jar of red ware with incised continuous wavy lines in the exterior, of medium fabric, showing an oxidized core, treated with a fine brown slip. From an early level of Sub-period IA.¹³

¹³ Cf. Maharana, B.M. Pande and B.D. Chattopadhyaya (ed.), *op.cit.*, Fig. 10.5.

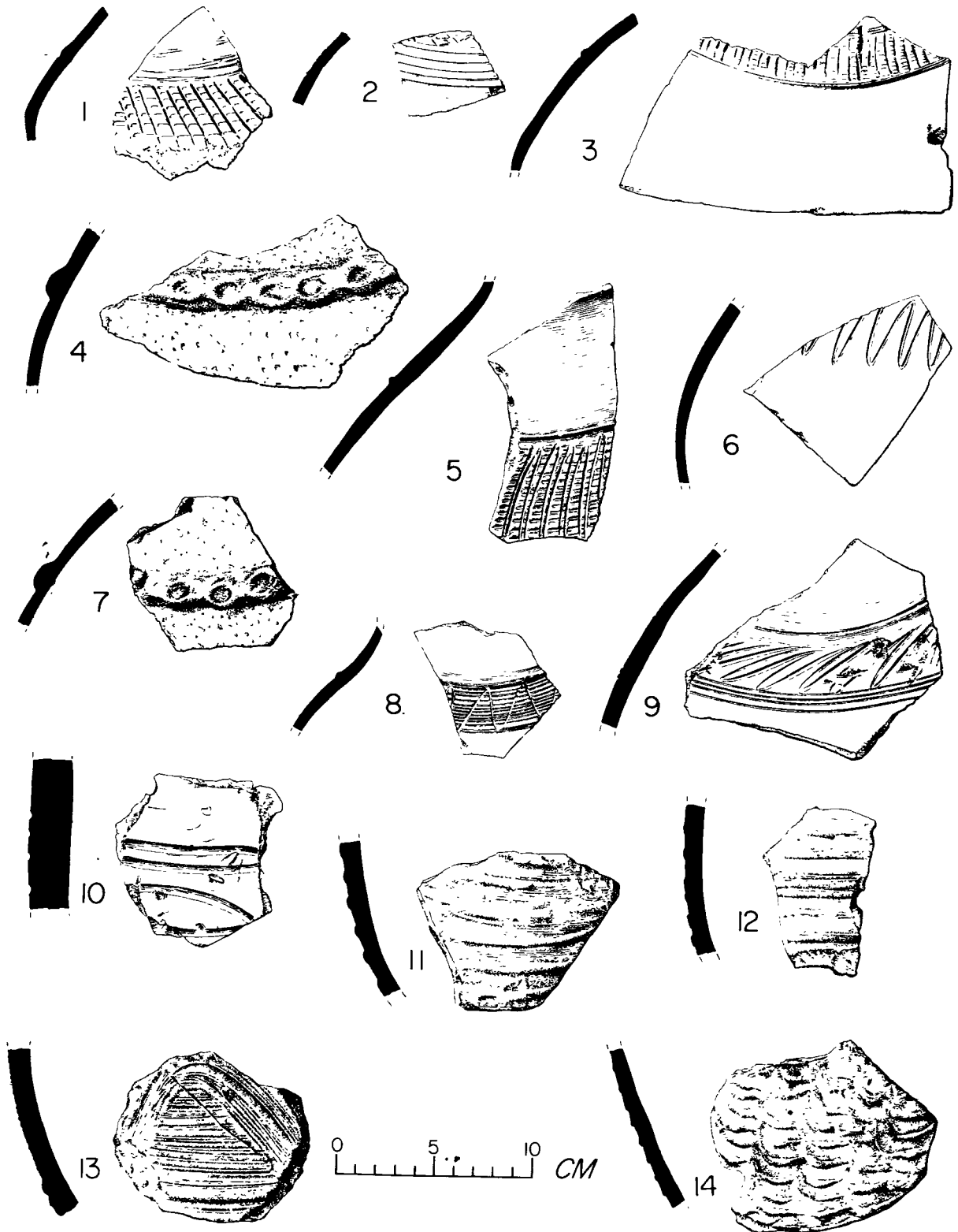


FIG. 25 : Incised pottery, Sub-period IA and IB

7. Fragmentary shoulder, of a jar of red ware with an applique rope design in the exterior, of medium fabric, showing an incomplete oxidized greyish core, treated with a brown slip. From a late level of Sub-period IB.

8. Fragmentary shoulder, of a jar of red ware with an incised group of horizontal lines cut by regular wavy lines in the exterior, of fine fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.

9. Shoulder part of a jar of red ware with incised regular zigzag lines within horizontal lines bringing out a leaf pattern in the exterior, of fine fabric, showing an oxidized core, treated with brown fine slip. From a mid-level of Sub-period IA.

10. Shoulder fragment of a jar of red ware with an incised deep leaf surmounted by two horizontal lines in the exterior, hand made, of coarse fabric, showing an incomplete oxidized greyish core. From an early level of Sub-period IA.

11. Fragment of a jar of red ware with incised lines making mild parallel ridges over a rusticated surface in the exterior, of medium fabric, showing an oxidized core, treated with a cream slip. From a mid-level of Sub-period IA.

12. Fragment of a jar of red ware with parallel ridges over a rusticated surface in the exterior, of medium fabric, showing an oxidized core, treated with ochre wash. from a mid-level of Sub-period IA.

13. Fragment of a jar of red ware with incised horizontal lines and fills enclosed by a groups of lines in the exterior, of fine fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IA.

14. Fragment of a jar of red ware with incised regular ridges making a rippled design in the exterior, of fine fabric, showing an oxidized core, treated with an ochre wash. From a mid-level of Sub-period IA.

FIG. 26; PLS. XX-XXI AND G-H

1. Shoulder, of a jar of red ware with incised group of vertical lines and small horizontal lines in the exterior, of medium fabric, showing an incomplete oxidized grey core, treated with a dark brown wash. From a mid-level of Sub-period IA.

2. Blunt carinated body portion of a jar of red ware, with incised leaf like pattern and groups of regular lines below in the exterior having a rusticated lower surface portion, of medium fabric, showing an oxidized core, treated with a dark brown slip. From a mid-level of Sub-period IB.

3. Shoulder, of a jar of red ware with deep horizontal incised lines cut by oblique lines making ladder like pattern in the exterior, of fine fabric, showing an oxidized core, treated with a dark brown slip. From an early level of Sub-period IA.

4. Fragmentary sherd of a jar of red ware with incised deep horizontal lines cut by oblique lines making a ladder like pattern in the exterior, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.

5. Shoulder of a jar of red ware with an incised diamond pattern under a group of horizontal grooves

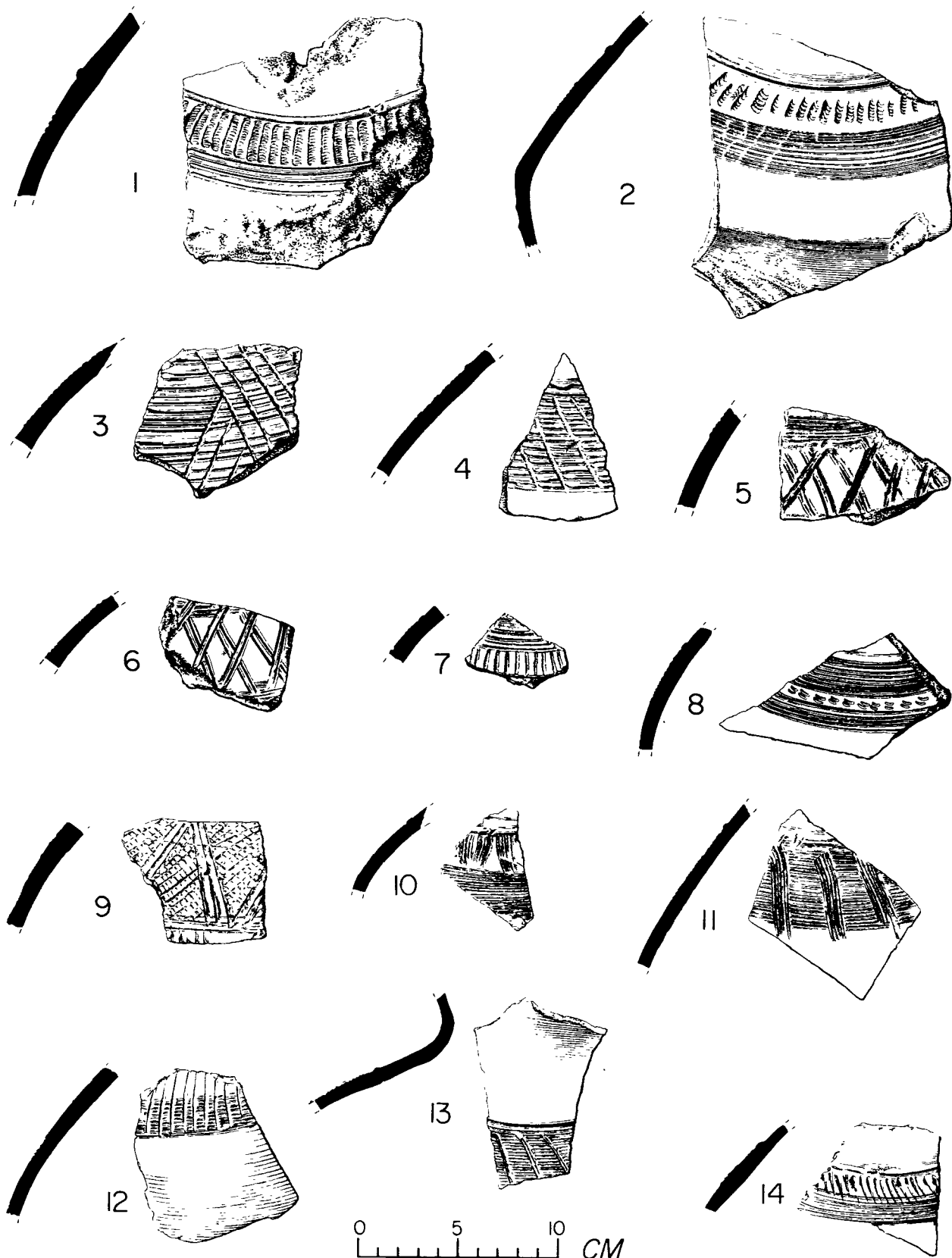


FIG. 26 : Incised pottery, Sub-period IA and IB

in the exterior, of medium fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IB.¹⁴

6. Fragment of jar of red ware with an incised diamond pattern between horizontal grooves in the exterior, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IA.

7. Fragment of a jar of red ware with incised vertical deep lines within horizontal grooves in the exterior, of medium fabric, showing an oxidized core, treated with a bright brown slip. From a mid-level Sub-period IA.

8. Shoulder, of a jar of red ware with incised lines showing a double nail pattern within the groups of horizontal lines in the exterior, of medium fabric, showing an oxidized core, treated with self-slip. From an early level of Sub-period IB.

9. Fragment of a jar with incised triangles filled in by a latticated pattern with two horizontal grooves in the exterior, of medium fabric, showing an oxidized core, treated with a dark brown wash. From an early level of Sub-period IB.

10. Fragment of a jar of red ware with groups of oblique and wavy lines above a group of deep horizontal lines in the exterior, of medium fabric, showing an oxidized core, treated with a brown wash. From a mid-level of Sub-period IA.

11. Fragment of a jar of red ware with incised group of horizontal lines cut by oblique lines in the exterior, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.

12. Fragment of a jar of red ware with horizontal lines cut by vertical lines in the exterior, of medium fabric, showing an oxidized core, treated with a dark brown slip. From a mid-level of Sub-period IA.

13. Shoulder, of a jar of red ware with incised horizontal lines cut by double oblique lines in the exterior, of medium fabric, showing an oxidized core, treated with a red slip. From a mid-level of Sub-period IA.

14. Fragment of a jar of red ware with deep oblique nail impressed lines above horizontal lines in the exterior, of medium fabric, showing an oxidized core, treated with a red slip. From mild level of Sub-period IB.

FIG. 27; PLS. XXII-XXIII AND I-J

1. Fragment of a trough of red ware with an externally flanged rim incised in the interior with wavy lines treated with a buffish slip. From a mid-level of Sub-period IA.¹⁵

¹⁴ Cf. Mahorana, B.M. Pande and B.D. Chattopadhyaya (ed.), *op.cit.*, no. 11, fig. 11.36.

¹⁵ In 'fabric D' of Kalibangan, Period I (Pre-Harappan), deep incised designs are generally available in the interior of the troughs. However, incised wavy lines are also available in the exterior. This tradition of incised designs appears to be continuing upto the late Harappan-times; cf. Bahadarabad, *Op.cit.*, fig. 13, 14A, 15, Fig. 15.8, 9, 10; Siswal, fig 18.1, 2; Mohenjodaro, G.F. Dales and J.M. Kenoyer, *Excavations at Mohenjodaro, Pakistan, The Pottery* (Pennsylvania 1986), Plate, 4; Also see Kayatha combed ware, Z.D. Ansari and M.K. Davlikar, *op.cit.*, p. 33, pl. VII.

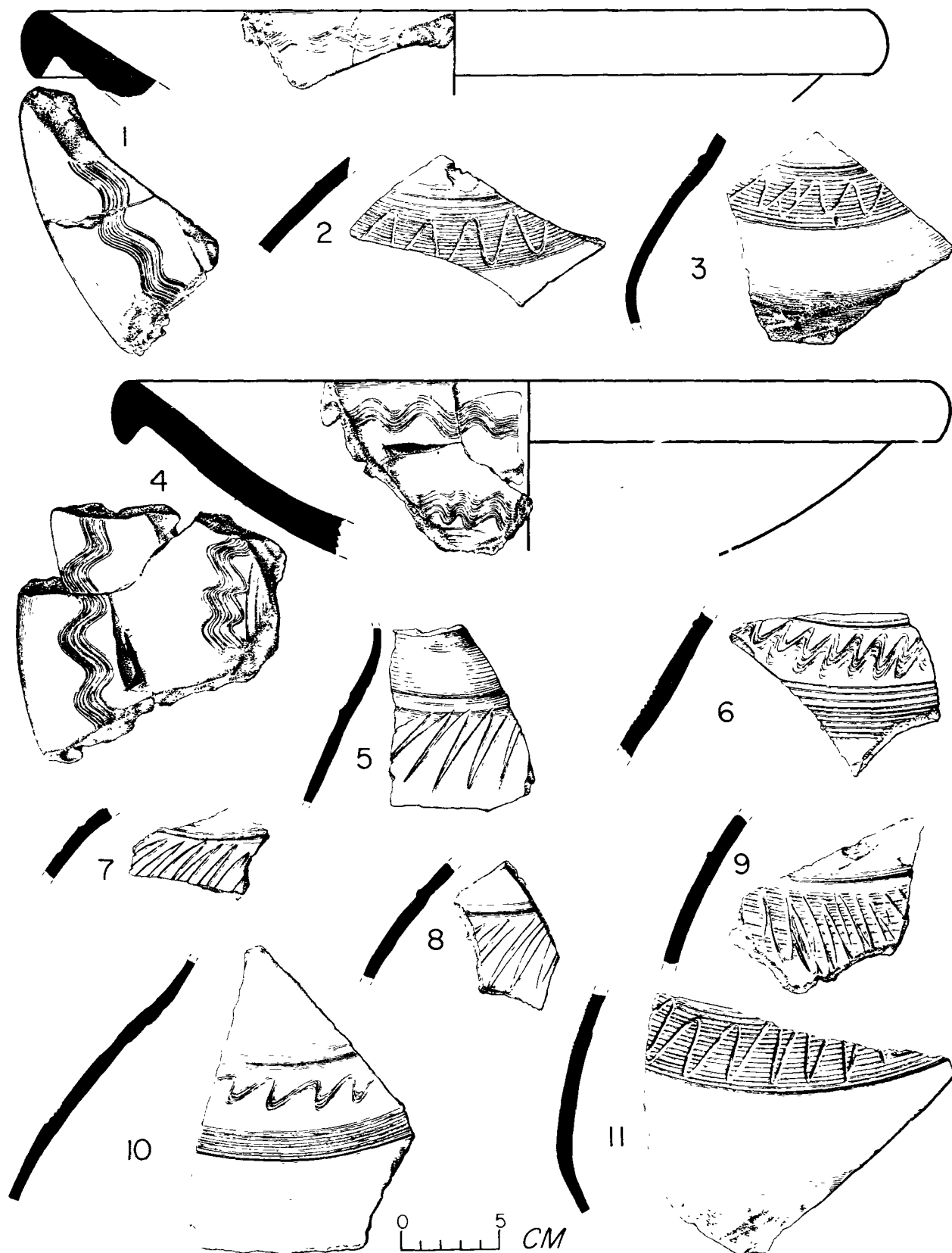


Fig. 27 : Incised pottery, Sub-period IA and IB

2. Shoulder, of a jar of red ware incised externally with group of horizontal lines cut by regular wavy lines, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.

4. Trough with a flanged rim, of red ware with two groups of incised wavy lines in the interior, of medium fabric, showing an incomplete oxidized greyish core, treated with a brown slip. From an early level of Sub-period IA.

5. Shoulder, of a vase of red ware with incised regular zigzag lines in the exterior, of medium fabric, showing an oxidized core, treated with a brown slip. From a mid-level of Sub-period IA.

6. Fragment of a jar of red ware with incised group of wavy lines above and horizontal deep lines below in the exterior, of fine fabric, showing an oxidized core, treated with a dark brown slip. From a mid-level of Sub-period IA.

7. Fragmentary jar of red ware with an incised leaf like pattern in the exterior, of medium fabric, showing an oxidized core, treated with a brown slip. From a early level of Sub-period IA.

8. Fragment of a jar of red ware with an incised group of leaf like design and above a groups of horizontal lines, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

9. Fragmentary jar of red ware with an incised leaf like pattern in the exterior, of medium fabric, showing an oxidized core, treated with a brown slip. From an early level of Sub-period IA.

10. Shoulder of a jar of red ware with incised horizontal lines in the exterior, of medium fabric, showing an oxidized core, treated with a dark brown slip. From an early of Sub-period IA.

11. Fragment of a jar of red ware with an incised group of horizontal lines cut by regular wavy lines in the exterior, of medium fabric, showing an oxidized core treated with a red wash. From a mid-level of Sub-period IA.

FIG. 28

(Also see fig. 21, nos. 19, 28-31)

1. Jar of thick grey ware with an externally collared rim, of medium fabric, treated with a self-slip. From an early level of Sub-period IB.

2. Vase of thick grey ware with an out-turned thickened rim, of coarse fabric, showing an incomplete oxidized core, treated with a self wash. From an early level of Sub-period IB.

3. Vase of thick grey ware with a flaring thickened under-cut rim, of medium fabric, showing an oxidized core, treated with a grey slip. From an early level of Sub-period IB

4. Vase of grey ware with an out-turned thickened rim, of fine fabric, showing an incomplete oxidized core, treated with a self slip. From a mid-level of Sub-period IB.

5. Vase of thick grey ware with externally thickened rim and slightly tapering shoulder, of coarse fabric, showing an oxidized core, treated with a self slip. From a late level of Sub-period IB.

6. Vase of thick grey ware with an out-turned thickened flanged undercut rim, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

THE POTTERY

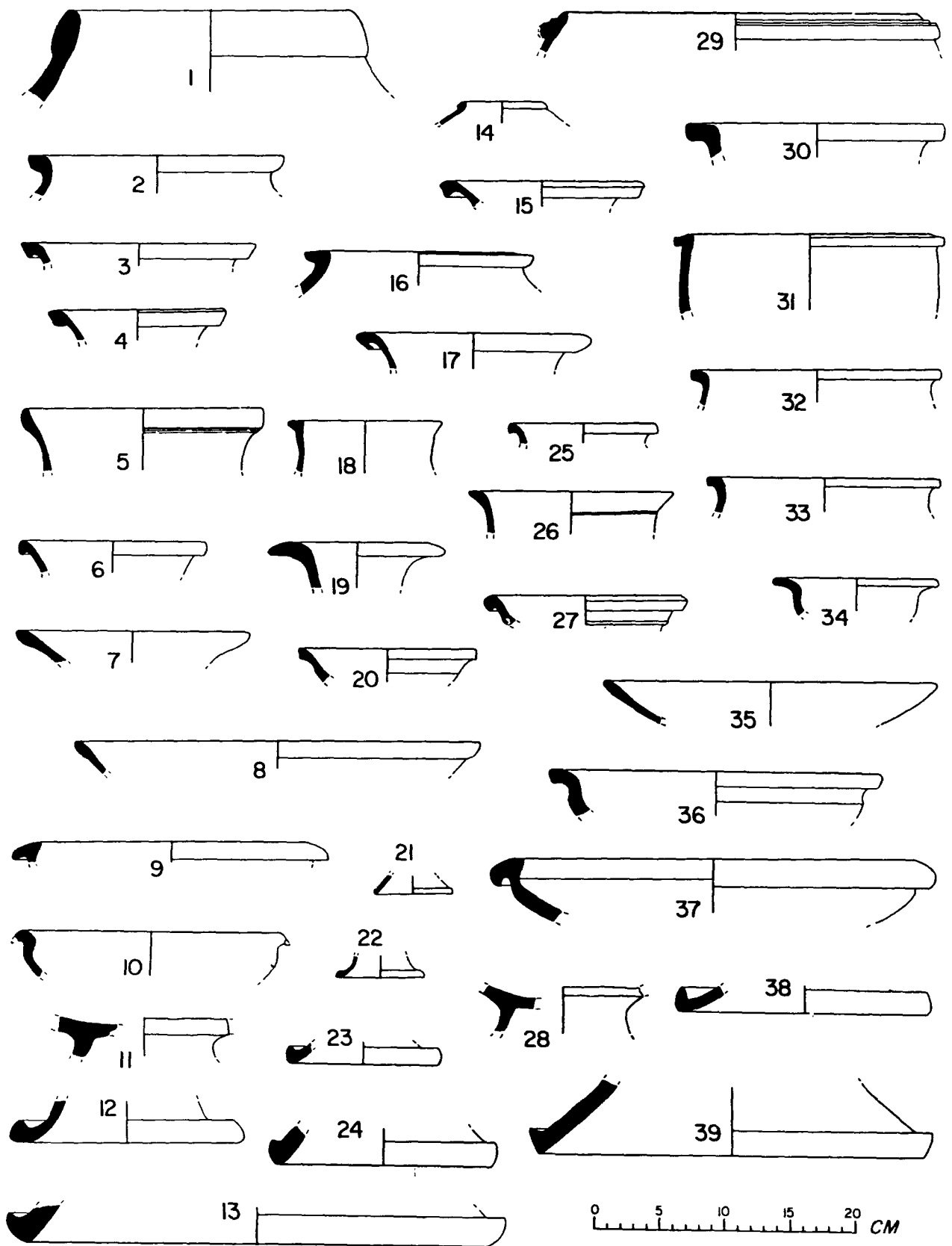


FIG. 28 : Painted Grey Ware and Grey Ware, Sub-period IB

7. Bowl of thick grey ware with a thickened featureless rim, of coarse fabric, showing an oxidized core, treated with a self-wash. From a late level of Sub-period IB.

8. Dish of thick grey ware with thickened beaded rim, of coarse fabric, showing an oxidized core, treated with a grey slip. From a late level of Sub-period IB.

9. Basin of thick grey ware with an out-turned flanged undercut rim, of fine fabric, showing a complete oxidized core, treated with a self-slip. From a late level of Sub-period IB.

10. Bowl of grey ware with an out-turned beaked and flanged rim, and slightly carinated shoulder, of fine fabric, showing an oxidized core, treated with a grey slip. From a mid-level of Sub-period IB.

11. Fragment of a stand of a dish-on-stand of thick grey ware with hollow flaring stem, of medium fabric, showing an oxidized core, treated with a self-slip. From a late level of Sub-period IB.

12. Stand of a dish-on-stand of thick grey ware with a raised edge on the base, of medium fabric, showing an incomplete oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

13. Stand of a dish-on-stand of thick grey ware with a raised ridge on the base and flaring sides, of medium fabric, showing an oxidized core, treated with a dark slip which has peeled off at most of the surface. From a mid-level of Sub-period IB.

14. Jar of thick grey ware with thickened out-turned collared rim and having a bulbous profile, of coarse fabric, showing an oxidized core, treated with a self-slip. From an unstratified level.

15. Vase of thick grey ware with an out-turned thickened undercut flaring rim, of medium fabric, showing an oxidized core, treated with a grey slip. From a mid-level of Sub-period IB.

16. Jar of thick grey ware with an out-turned projected and flanged rim and tapering shoulder, of coarse fabric, showing an oxidized core, treated with a dark grey slip. From a mid-level of Sub-period IB.

17. Vase of grey ware with a beaked rim, of medium fabric, showing an oxidized core, treated with a grey slip. From a mid-level of Sub-period IB.

18. Vase of thick grey ware with an externally splayed out flaring rim, of medium fabric, showing an oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

20. Bowl of grey ware with an out-turned featureless rim and tapering sides, of medium fabric, showing an oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

21. Miniature stand of a dish-on-stand of grey ware with a slightly raised ridge on the base, of medium fabric, showing an oxidized core, treated with a grey wash. From an unstratified level.

22. Miniature stand of a dish-on-stand, of fine grey ware with a raised ridge on the base, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

23. Miniature stand of a dish-on-stand of thick grey ware with a raised ridge on the base, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

24. Stand of a dish-on-stand of thick grey ware with a raised ridge on the base, of coarse fabric, showing an oxidized core, treated with a grey slip. From a late level of Sub-period IB.

25. Miniature vase of grey ware with an out-turned beaded rim, of fine fabric, showing a complete oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

26. Vase of grey ware with a splayed out rim, of coarse fabric, showing an oxidized core, treated with a self wash. From a late level of Sub-period IB.

27. Miniature bowl of grey ware with flanged beaded undercut rim, of medium fabric, showing an oxidized core, treated externally with a grey slip. From a mid-level of Sub-period IB.

28. Fragment of a dish-on-stand of thick grey ware with a hollow flaring sides, of medium fabric, showing an oxidized core, treated with a grey wash. From a late level of Sub-period IB.

29. Jar of dark grey ware with a concave and externally grooved rim and tapering sides, of coarse fabric, showing an oxidized core, treated with a grey slip. From a late level of Sub-period IB.

30. Vase of thick grey ware with an externally splayed out rim, of medium fabric, showing an oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

31. Jar of grey ware with an externally projected rim, of coarse fabric, showing an incomplete oxidized core, treated with a grey slip. From an early level of Sub-period IB.

32. Miniature vase of grey ware with a splayed out rim and concave sides, of medium fabric, showing an oxidized core, treated with a grey slip. From a mid-level of Sub-period IB.

33. Vase of grey ware with an externally out-turned rim and concave neck, of medium fabric, showing an oxidized core, treated with a grey slip. From a mid-level of Sub-period IB.

34. Bowl-cum-lid of grey ware with an splayed out rim, of medium fabric, showing an oxidized core, wet smoothened, treated with a grey wash. From a mid-level of Sub-period IB.

35. Bowl of grey ware with a featureless rim, of medium fabric, showing an oxidized core, treated with a grey wash. From an early level of Sub-period IB.

36. Basin of thick grey ware with an externally splayed out rim and carinated neck, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

37. Basin of thick grey ware with an out-turned flanged undercut rim, of medium fabric, showing an incomplete oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

38. Fragment of a stand of a dish-on-stand of thick grey ware with a raised ridge on the base, medium fabric, showing an oxidized core, treated with a self-wash. From a mid-level of Sub-period IB.

39. Stand of a dish-on-stand of thick grey ware with a raised ridge on the base, of medium fabric, showing an incomplete oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

FIG. 29

1. Bowl of grey ware with a vertical internally sharpened rim having straight sides carinated to a sagger base, painted in black on the exterior wall with a set of running opposed double sided hooks made horizontally, of fine fabric, showing an oxidized core, treated externally with a dark grey slip. From an early level of Sub-period IB.

2. Bowl of grey ware with a vertical internally sharpened rim, straight sides and carinated to a sagger base, painted in black with horizontal band on the exterior and interior of the rim, of fine fabric, showing an oxidized core treated with a self slip. From a late level of Sub-period IB.

3. Deep bowl of grey ware with a vertical internally sharpened rim and almost straight sides, painted in black with opposed spirals put horizontally, of fine fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

4. Deep bowl of grey ware with an out-turned internally sharpened rim, slightly incurved sides

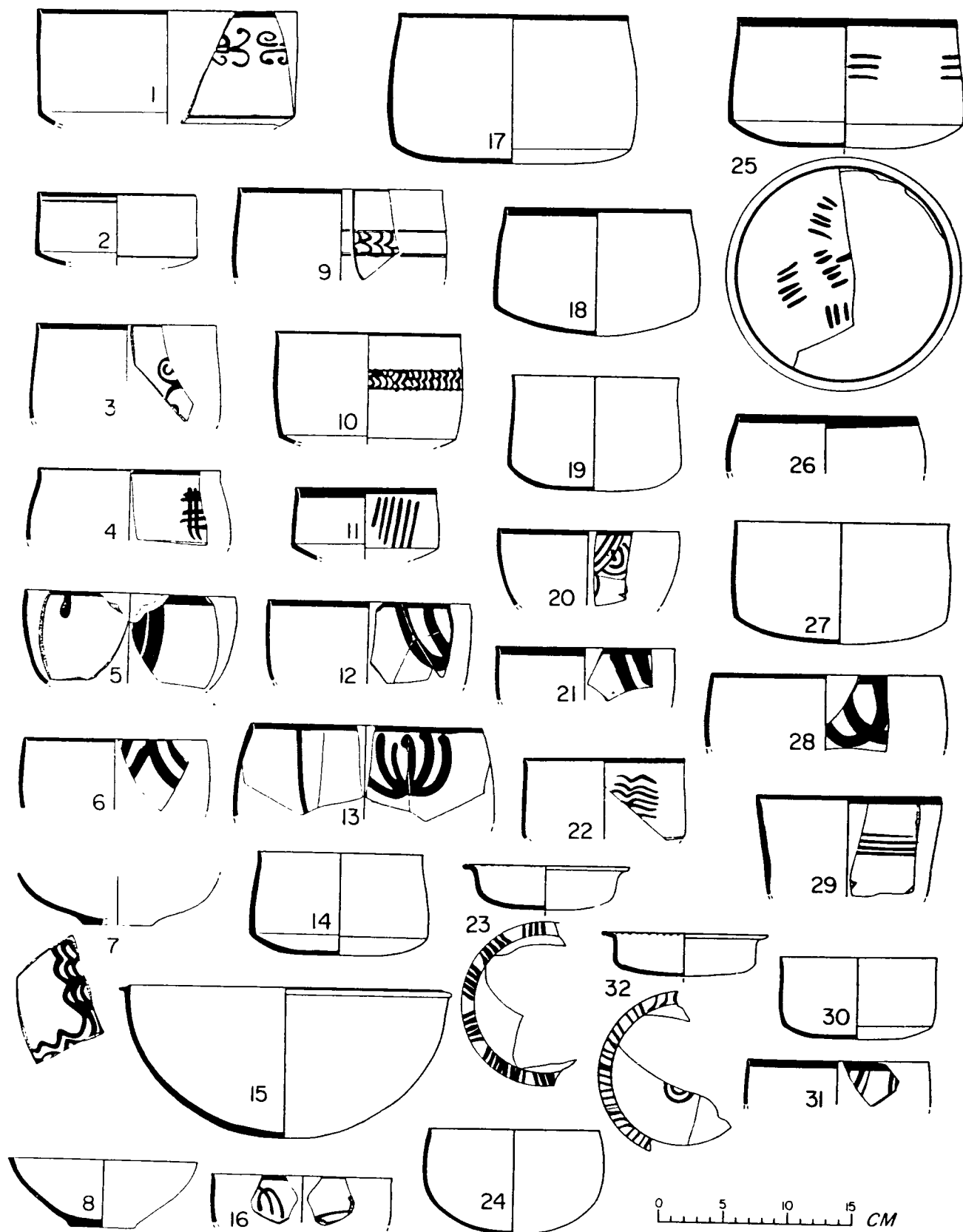


FIG. 29 : Painted Grey Ware and Grey Ware, Sub-period IA and IB

painted in black with a chequer pattern on the exterior and a band on the exterior of the rim, of fine fabric, showing complete oxidized core, treated with a self slip. From a mid-level of Sub-period IB.

5. Bowl of grey ware with featureless rim and convex sides painted in black with a roughly thick vertical and thin band in the exterior and a thin band with a finger impression below, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-level of Sub-period IB.

6. Bowl of grey ware with a vertical internally sharpened rim and slightly convex sides painted in black with festoon like double lines, of medium fabric, showing an oxidized core, treated with a grey wash. From a late level of Sub-period IB.

7. Lower portion of a bowl of grey ware with convex sides and discular flat base, painted in black with a group of wavy lines on the inner base, of medium fabric, showing an oxidized core, treated with a grey slip. From a late level of Sub-period IA.

8. Complete bowl of grey ware with everted rim tapering sides and footed discular flat base, of fine fabric, showing an oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

9. Deep bowl of grey ware with internally sharpened rim and straight sides painted in black with a group of running sigmas within two incised horizontal lines on the exterior walls, of fine fabric, showing an oxidized core treated with a fine grey wash. From a late level of Sub-period IB.

10. Deep bowl of grey ware with internally sharpened rim and vertical sides painted in black with a group of running sigmas within two incised horizontal lines, of fine fabric, showing an oxidized core treated with a dark grey wash. From a mid-level of Sub-period IB.

11. Bowl of grey ware with internally sharpened rim straight sides and carinated to a sagger base with painted externally in black, a group of six oblique lines, of fine fabric, showing an oxidized core, treated with a grey wash. From an unstratified level.

12. Deep bowl of grey ware with a sharpened rim and vertical sides, with two thick curved lines, painted in black on the external wall, of medium fabric, showing an incomplete oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

13. Bowl of grey ware with featureless rim and slightly concave sides painted in black making a lotus like pattern on the exterior and a thin band on the rim and almost a vertical line on the wall in the interior, of fine fabric, showing an oxidized core treated with a dark grey wash. From a mid-level of Sub-period IB.

14. Deep bowl of grey ware with a featureless rim straight sides and carinated to a sagger base, of medium fabric, showing an oxidized core, treated with a self wash. From a late level of Sub-period IB.

15. Deep basin of grey ware with an externally projected rim and rounded profile, of fine fabric, showing an oxidized core treated with a self wash. From a mid-level of Sub-period IB.

16. Fragment of a bowl of grey ware with internally sharpened rim and straight sides painted in black with a stylized drooping flower in the interior and bands in the exterior, of fine fabric, showing an oxidized core treated externally with a dark grey slip. From a late level of Sub-period IB.

17. Deep bowl of grey ware with featureless rim, slightly concave sides with carination to a sagger, base, of fine fabric, showing a complete oxidized core, treated with a black slip. From a late level of Sub-period IB.

18. Deep bowl of grey ware with featureless rim straight sides with blunt carination to a sagger

base, painted in black with a band on the exterior and interior of the rim, of fine fabric, showing an oxidized core treated with a grey wash. From a late level of Sub-period IB.

19. Deep bowl of grey ware with featureless rim with almost straight sides and a blunt carination to a sagger base, of medium fabric, showing a complete oxidized core treated with a dark grey wash. From a late level of Sub-period IB.

20. Fragmentary bowl of grey ware with featureless rim and convex sides, painted in black with oblique lines joined by concentric semi-circles with a dot in the centre in the exterior and a band on the rim in the exterior and interior, of fine fabric, showing an oxidized core, treated with a self wash. From a late level of Sub-period IB.

21. Bowl of grey ware with an internally sharpened rim and straight sides, painted in black with two thick oblique lines and a band on the top in the exterior and in the interior of the rim, of medium fabric, showing an oxidized core, treated with a dark grey slip on the exterior. From an early level of Sub-period IB.

22. Deep bowl of grey ware with an internally sharpened rim having vertical sides and carinated to a sagger base (?), painted in black with a group of six wavy lines in the exterior and with a band on the exterior and interior of the rim, of fine fabric, showing an oxidized core treated with a self wash. From a late level of Sub-period IB.

23. Bowl of grey ware with an externally splayed out flanged rim, tapering shoulder and a flat base, painted in black with groups of five lines on the top of the rim, of fine fabric, showing an oxidized core treated with a grey wash. From a mid-level of Sub-period IB.

24. Deep bowl of grey ware with a sharpened rim and rounded sides and saggar base, of fine fabric, showing an oxidized core treated with a self wash. From a late level of Sub-period IB.

25. Deep bowl of grey ware with a sharpened rim, straight sides and carinated to a sagger base, painted in black with groups of three horizontal strokes on the exterior and a groups of oblique strokes and slashes on the inner base and a band on the exterior and interior of the rim, of medium fabric, showing an oxidized core, treated with a self wash. From a mid-late level of Sub-period IB.

26. Fragmentary bowl of grey ware with an internally sharpened rim with convex sides, painted in black with a band on the exterior and interior of the rim, of medium fabric, showing an oxidized core treated with a self wash. From a late level of Sub-period IB.

27. Deep bowl of grey ware with a sharpened rim and vertical thin sides and a carination to a sagger base, of fine fabric, showing complete oxidized core, treated with a grey wash. From a mid-level of Sub-period IB.

28. Fragmentary bowl of grey ware with a featureless rim and straight sides painted in black with intersecting loops on the external wall, of fine fabric, showing an oxidized core treated with a dark grey wash. From a late level of Sub-period IB.

29. Deep bowl of grey ware with a sharpened rim and straight sides, painted in black with four horizontal bands on the external wall and a band on the exterior and interior of the rim, of medium fabric, showing complete oxidized core, treated with a self wash. From a late level of Sub-period IB.

30. Deep bowl of grey ware with a sharpened rim and straight sides and a carination to a flat base, of fine fabric, showing a well oxidized core treated with a self wash. From a late level of Sub-period IB.

31. Fragment of a bowl of grey ware with a sharpened rim and straight sides, painted in black with oblique lines on the external wall and a band on the exterior and interior of the rim, of fine fabric, showing an oxidized core, treated with a grey wash. From a late level of Sub-period IB.

32. Miniature bowl of grey ware with a splayed out flanged rim, straight sides and blunt carination to a sagger base, painted in black with parallel strokes and curved line on the top of the rim and concentric circles in the inner base, of fine fabric, showing an oxidized core, treated with a self-wash. From a late level of Sub-period IB.

FIG. 30

1. Dish of grey ware with a vertical internally sharpened rim and incurved sides with a flat base, painted in black in the inner base making a pattern of lotus flowers with irregular semi-circles in the centre and a band on the rim, of fine fabric, showing an oxidized core, treated with a self slip. From a mid-level of Sub-period IB.

2. Dish of grey ware with an incurved sharpened rim convex sides, convex base, painted in black making a pattern of a group of oblique lines joined to semi-circles having double semi-circles at the centre with a dot or circle in the inner base, of fine fabric, showing a well oxidized greyish core, treated with a self slip. From an early level of Sub-period IB.

3. Fragment of a dish of grey ware with an incurved sharpened rim, painted in black on the inner base with oblique lines in a group and roughly drawn semi-circles with a dot in the centre with oblique lines emanating from the outer semi-circle below, showing well oxidized core, treated with a self wash. From a late level of Sub-period IB.

4. Dish of grey ware with an internally sharpened rim and blunt carinated flat base, painted in black with group of dashes of four in the inner base and a thick band on the inner side and a thin band in the outer side of the rim, of fine fabric, showing an oxidized core, treated with a self slip. From a late level of Sub-period IB.

5. Dish of grey ware with an incurved rim and sagger base, painted in black making a pattern of four curved strokes and a lotus like design on the inner wall and base, of fine fabric, showing a complete oxidized core, treated with a grey wash. From a late level of Sub-period IB.

6. Dish of grey ware with a featureless rim, convex sides and flat base, of medium fabric, showing an oxidized core treated with a dark grey slip. From a mid-level of Sub-period IB.

7. Dish of grey ware with a sharpened rim and convex sides and sagger base, painted in black making a pattern roughly of 'V' shape in double lines and dot in semi-circle below in the inner wall and a band in the outer and inner sides of the rim, of fine fabric, showing an oxidized core, treated with a self-slip. From a late level of Sub-period IB.

8. Dish of grey ware with a thickened featureless rim, incurved sides and sagger base, painted in black making a pattern of circles, semi-circles with a dot and oblique lines on the inner wall and base, of fine fabric, showing completely oxidized core, treated with a self-slip. From an early level of Sub-period IB.

9. Dish of grey ware with an externally sharpened rim and flat base, painted in black making a

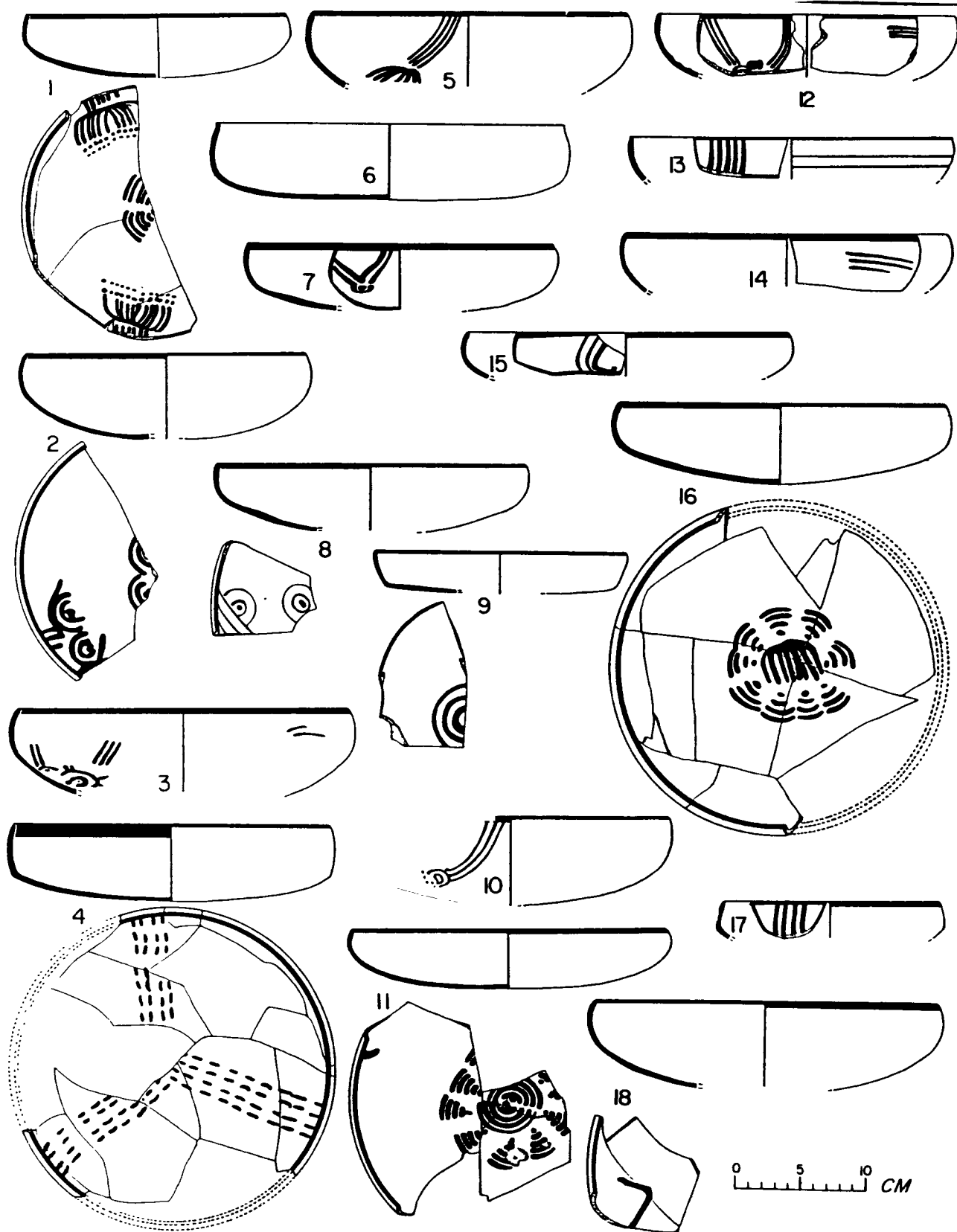


FIG. 30 : Painted Grey Ware and Grey Ware, Sub-period IB

pattern of circles in the inner base, of fine fabric; showing an oxidized core, treated with a grey slip. From an unstratified level.

10. Dish of grey ware with a vertical featureless rim and sagger base, painted in black making a pattern of curved lines joined with roughly drawn semi-circles and dots below on the inner wall and base, of fine fabric, showing an oxidized core, treated with a dark grey slip. From an early level of Sub-period IB.

11. Dish of grey ware with an incurved rim, convex sides and a flat base, painted in black with a roughly painted three circles/semi-circles having semi-circles with a knob like dot at the centre with a group of semi-circles having a dot all around in the inner base, of fine fabric, showing an oxidized core, treated with a fine dark grey wash. From an early level of Sub-period IB.

12. Dish of grey ware with a thickened featureless rim, incurved sides and flat base, painted in black with semi-circles and groups of oblique and curved strokes on interior wall and horizontal strokes on the external wall and a band in the inner and outer side of the rim, of fine fabric, showing a complete oxidized core, treated with a self-slip. From a late level of Sub-period IB.

13. Dish of grey ware with a sharpened rim, painted in black with a group of vertical lines on internal wall, of fine fabric, showing an oxidized core, treated externally with a black slip. From a mid-level of Sub-period IB.

14. Dish of grey ware with an incurved rim, convex sides and flat base, painted in black with three horizontal strokes on the external wall and a band on the inner and outer side of the rim, of fine fabric, showing an oxidized core, treated externally with a dark grey wash. From an unstratified level.

15. Dish of grey ware with a featureless rim and convex sides, painted in black with a group of three curved lines on the internal wall, of fine fabric, showing an oxidized core, treated with a self-wash. From mid-level of Sub-period IB.

16. Dish of grey ware, with an internally curved rim convex sides, and sagger base, painted in black in the inner base with a lotus like design in the centre surrounded by groups of semi-circles with a dot underneath, of medium fabric, showing an oxidized core, treated with a dark grey wash. From an early-level of Sub-period IB.

17. Dish of grey ware with inturned sharpened rim and sides carinated to a sagger base, painted in black showing four vertical lines on the inner wall, of fine fabric, showing an oxidized core, treated with self-slip. From an early-level of Sub-Period IB.

18. Dish of grey ware with incurved rim with convex sides and flat base, painted in black with roughly 7 (seven) shaped design on the inner base, of medium fabric, showing complete oxidized core, treated with self-wash. From a mid-level of Period IB.

FIG. 31; PLS. XXIV AND K

1. Fragment of base of a dish of grey ware painted in black inside with a floral pattern having a double circle with a dot encircled by five double semi-circles with a dot at the centre, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

2. Base fragment of a dish of grey ware painted in black inside with a circle having five double

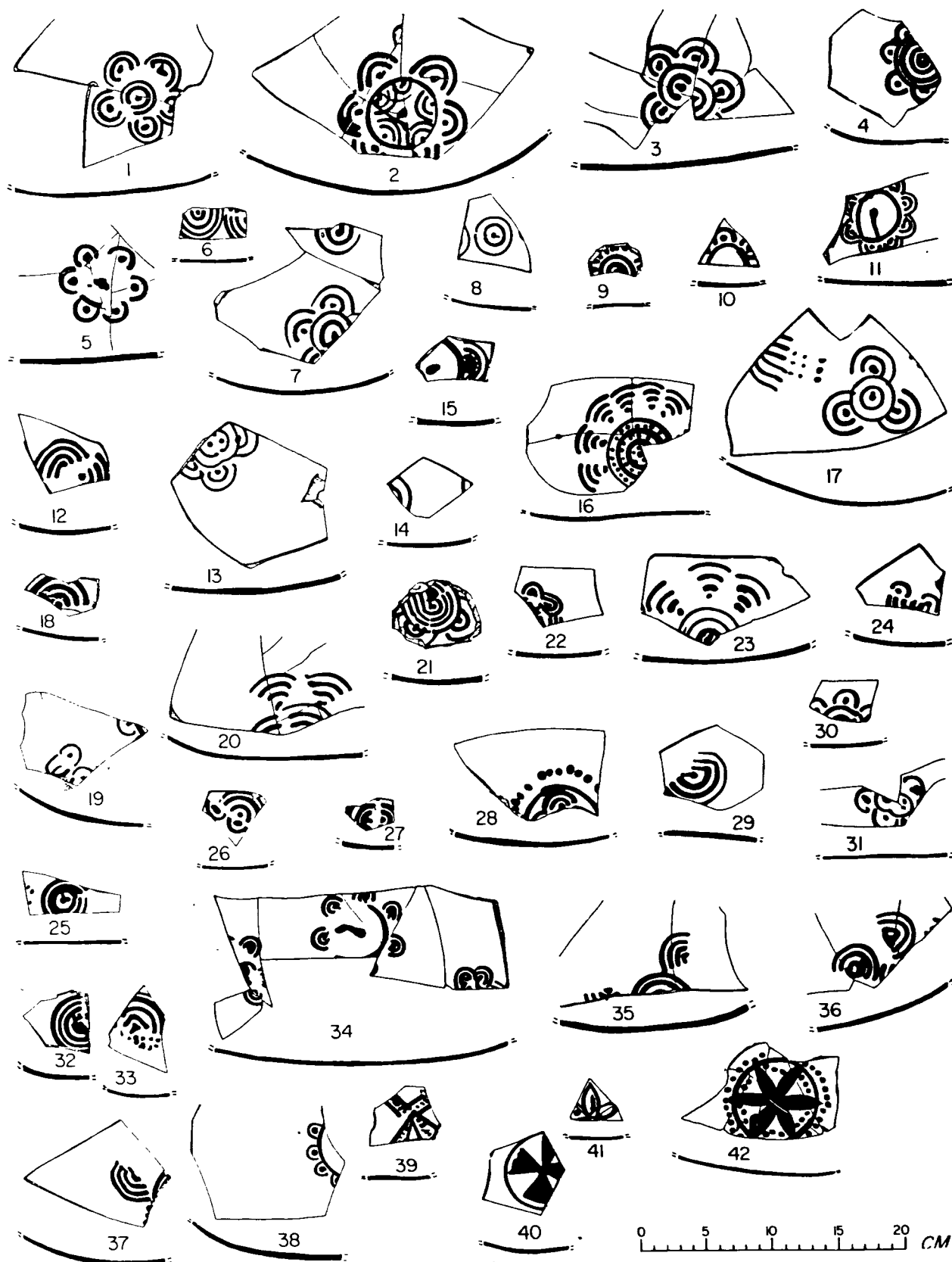


FIG. 31 : Painted Grey Ware and Grey Ware, Sub-period IB

semi-circles with a dot encircled by six double semi-circles with a dot, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

3. Fragmentary base, of a dish of grey ware painted in black inside having two double semi-circles with a dot encircled by six (?) double semi-circles with a dot joining each other, having an oxidized core, of fine fabric. From a mid-level of Sub-period IB.

4. Base fragment of a dish of grey ware painted in black inside with a floral pattern with four circles encircled by four semi-circles with a dot, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

5. Base fragment of a dish of grey ware painted in black inside with a dot in the centre encircled by six semi-circles with a dot, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

6. Base fragment of a dish of grey ware painted in black inside with a group of four semi-circles with a dot in the centre, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

7. Base fragment of a dish of grey ware painted in black inside with concentric circles with a dot in the centre and encircled by four double semi-circles with a dot in the centre, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

8. Base fragment of a dish of grey ware painted in black inside with double concentric circles (?) with a dot at the centre, of a fine fabric. From a mid-level of Sub-period IB.

10. Fragmentary base, of a dish of grey ware painted in black inside with a circle in the centre and semi-circle with a dot around, of fine fabric. From a mid-level of Sub-period IB.

11. Base fragment of a dish of grey ware painted in black inside with a circle in the centre having a dot-slash surrounded by double semi-circles with a dot (overall appearance of a clock pattern), of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

12. Fragment of a dish of grey ware painted in black inside with roughly semi-circles in a group of four and three and a dot, of fine fabric. From an early level of Sub-period IB.

13. Base fragment of a dish of grey ware painted in black inside with a centrally placed circle made out of two semi-circles with three dots surrounded by double concentric semi-circles with a dot, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

14. Base fragment of grey ware painted in black inside with double semi-circles, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

15. Base fragment of a dish of grey ware painted in black inside with semi-circles and dots, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

16. Base fragment of a dish in grey ware painted in black inside with triple concentric circles with dots in the centre encircled by groups of semi-circles with a dot. From an early level of Sub-period IB.

17. Base fragment of a dish of grey ware painted in black inside with double concentric circle with a dot in the centre encircled by three double semi-circles with a dot, on the left horizontal and wavy lines with a row of three dots, probably a floral pattern in three groups, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

18. Base fragment of a dish of grey ware painted in black inside with triple semi-circles and a dot and incised lines, of medium fabric, showing an oxidized core. From an early level of Sub-period IB.

19. Base fragment of a dish of grey ware painted in black inside with semi-circle with a dot and another semi circle with a projected line in the centre, colour has become brown, of fine fabric, showing semi-oxidized core. From a mid-level of Sub-period IB.

20. Base fragment of a dish of grey ware painted in black inside with a group of triple concentric semi-circles with a dot, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

21. Base fragment of a dish of grey ware painted in black inside with concentric circles encircled by semi-circles with a dot, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

22. Base fragment of a dish of grey ware painted in black inside with double semi-circles with a dot and oblique line, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

23. Base fragment of a dish of grey ware painted in black inside with triple concentric circles with a dot in the centre surrounded by partial semi-circles with a dot, of medium fabric, showing an oxidized core. From a mid-level of Sub-period IB.

24. Base fragment of a dish of grey ware painted in black inside with irregular pattern of semi-circles and dots, of medium fabric, showing an oxidized core. From a mid-level of Sub-period IB.

25. Base fragment of a dish of grey ware painted in black inside with triple semi-circles and dots in the centre, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

26. Base fragment of a dish of grey ware painted in black inside with triple semi-circles and dots and on the opposite side a row of a semi-circle, with a dot, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

27. Base fragment of a dish of grey ware painted in black inside with double opposite semi-circles and dots, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

28. Base fragment of a dish of grey ware painted in black inside with double semi-circles with dots inside encircled by a circle and dots all around, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

29. Base fragment of a dish of grey ware painted in black inside with triple semi-circles and a dot in the centre, of fine fabric. From an early level of Sub-period IB.

30. Base fragment of a dish of grey ware painted in black inside with double concentric circles in the centre and semi-circles with dots around, of medium fabric, showing an oxidized core. From a mid-level of Sub-period IB.

31. Base fragment of a dish of grey ware painted in black inside with semi-circles with dots around the two opposed semi-circles, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

32. Base fragment of dish of grey ware painted in black inside with a group of four semi-circles with a dot, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

33. Base fragment of a dish of grey ware painted in black inside with four semi-circles with irregular dots, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

34. Base fragment of a dish of grey ware painted in black inside with a semi-circle having double semi-circles with dots in the centre and on the edges also having semi-circles and dots, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

35. Base fragment of a dish of grey ware painted in black inside with three triple semi-circles and dots, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

36. Base fragment of a dish of grey ware painted in black inside with a group of irregular double semi-circles around a circle, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

37. Base fragment of a dish of grey ware painted in black showing a design of triple semi-circles and a dot, of medium fabric. From a mid-level of Sub-period IB.

38. Base fragment of a dish of grey ware painted in black inside with a circle surrounded by semi-circles and a dot in the centre, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

39. Base fragment of a dish of grey ware painted in black inside with four panels of oblique lines with dots inside, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

40. Base fragment of a dish of grey ware painted in black inside with a Maltese cross, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

41. Base fragment of a dish of grey ware painted in black inside with a three petalled flower having the evidence of making the outline first and then filling it with colour, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

42. Base fragment of a dish of grey ware painted in black inside with six-petalled flower made by a compass like instrument, first outline was drawn and then filled by colour; the flower is encircled by a circle with dots around having spotted area between the petals. From a mid-level of Sub-period IB.

FIG. 32

1. Base fragment of a dish of grey ware painted in black inside with four rows of scalloped pattern, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

2. Base fragment of a dish of grey ware painted in black inside having a flower with five groups of semi-circular petals emanating from a circle in the centre with an additional cactus like flower, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

3. Base fragment of a dish of grey ware painted in black inside with a circle in the centre and four rows (?) of overlapping petals around the circle, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

4. Base fragment of a dish of grey ware painted in black inside with petals of a flower made of close wavy lines, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

5. Base fragment of a dish of grey ware painted in black inside with a basket like design around a circle in the centre, of medium fabric, showing an oxidized core. From an early level of Sub-period IB.

6. Base fragment of a dish of grey ware painted in black inside, scallops arranged in a flower pattern, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

7. Base fragment of a bowl of grey ware painted in black inside with a flower like pattern with five rows of dashes, of medium fabric, showing an oxidized core. From an early level of Sub-period IB.

8. Base fragment of a dish of grey ware painted in black inside having a circle with a dot in the



FIG. 32 : Painted Grey Ware and Grey Ware, Sub-period IB

centre and having flames akin to sun-design, of medium fabric, showing an oxidized core. From a mid-level of Sub-period IB.

9. Base fragment of a dish of grey ware painted in black inside with a net like design around a circle, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

10. Base fragment of a dish of grey ware painted in black inside with a group of close wavy lines and dashes at a distance, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

11. Base fragment of a dish of grey ware painted in black ware inside with receding rectangles (?) making a stepped pattern, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

13. Base fragment of a dish of grey ware painted in black inside with a circle in the centre having five rows of scalloped pattern, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

14. Base fragment of grey ware painted in black inside with a cactus like plant, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

15. Base fragment of a dish of grey ware painted in black inside with a row of sigmas around a circle, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

16. Base fragment of a dish of grey ware painted in black inside with a chain-pattern in the centre, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

17. Base fragment of a dish of grey ware painted in black inside with a net pattern, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

18. Base fragment of a dish of grey ware painted in black inside with two semi-circles with a dot in the centre and the three dots, of medium fabric. From a mid-level of Sub-period IB.

19. Base fragment of a dish of grey ware painted in black inside with a row of cactus like plant all around and a circle in the centre, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

20. Base fragment of a dish of grey ware painted in black inside with a cactus like plant emanating from double semi-circles, of fine fabric. From a late level of Sub-period IB.

21. Base fragment of a dish of grey ware painted in black inside with cactus like pattern, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

22. A very thin base fragment of a dish of grey ware painted in black inside with dots and slashes, of very fine fabric, showing an oxidized core. From a late level of Sub-period IB.

23. Base fragment of a dish of grey ware painted in black inside with a row of hooks and semi-circles with a dot, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

24. Base fragment of a dish of grey ware painted in black inside with semi-circles and a dot within a circle having sigmas around and a hook, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

25. Base fragment of a dish of grey ware painted in black inside with double row of chains around a circle having a small circle at the centre, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

26. Base fragment of a dish of grey ware painted in black inside with a double chain pattern, of fine fabric. From a late level of Sub-period IB.

27. Base fragment of a dish of grey ware painted in black inside with a plant motif, of medium fabric, showing an oxidized core. From a mid-level of Sub-period IB.

28. Base fragment of a dish of a semi-fired grey ware, painted originally with wavy lines in black, but chocolate due to not fully oxidized condition, of fine fabric, showing an semi-oxidized core. From a late level of Sub-period IB.

29. Base fragment of a dish of grey ware painted in black inside with rows of wavy lines emanating from a double circle, of medium fabric. From an early level of Sub-period IB.

30. Base fragment of a dish of grey ware painted in black inside with pattern of three wavy lines, of medium fabric, showing fully oxidized core. From a late level of Sub-period IB.

31. Base fragment of a dish of grey ware painted in black inside with a group of wavy lines, of medium fabric. From a late level of Sub-period IB.

32. Fragment of a bowl of a grey ware painted in black outside with a panel consisting of vertical line with an oblique line coming out of it (plant like) and one horizontal line and a dot above, of medium fabric. From a late level of Sub-period IB.

33. Fragment of a bowl of grey ware painted in black with two vertical lines in the inner wall, of medium fabric, showing an oxidized core. From an early level of Sub-period IB.

34. Fragment of a bowl of grey ware painted outside with a scissor like pattern and a circle with a dot, of medium fabric, showing an oxidized core. From an early level of Sub-period IB.

35. Fragment of a bowl of grey ware painted in black outside with a panel of oblique lines with dots and a groove on the external wall, of medium fabric, with an oxidized core. From a late level of Sub-period IB.

36. Base fragment of a dish of grey ware painted in black inside with three vertical lines and semi circles with dots, of fine fabric with an oxidized core. From a late level of Sub-period IB.

37. Base fragment of a dish of grey ware painted in black inside with six horizontal lines and double semi-circles with a dot in the centre, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

38. Base fragment of a dish of grey ware painted in black inside with groups of three vertical and horizontal lines roughly crossing each other making a cross (?) like pattern, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

39. Base fragment of a dish of grey ware painted in black inside with two groups each having four wavy lines, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

40. Fragment of a bowl of grey ware painted in black inside with a row of five semi-circles and a dot below the incised line capped by five semi-circles with a dot on the left, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

41. Base fragment of a dish of grey ware painted in black inside with roughly horizontal lines, opposite to semi-circles, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

42. Base fragment of a dish of grey ware painted in black inside with three horizontal lines opposite to double semi-circles with a dot, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

43. Base fragment of a dish of grey ware painted in black inside with a oblique lines and double semi-circles with a dot, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

44. Base fragment of a dish of grey ware painted in black inside with oblique lines and dots and double semi-circles with a dot in the centre making a cross (?), of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

45. Base fragment of a dish of grey ware painted in black inside with a group of seven oblique lines and three semi-circles with a dot in the centre, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

46. Fragment of a dish of grey ware painted in black inside with oblique lines, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

47. Base fragment of a dish of grey ware painted in black inside with wavy lines surmounted by two semi-circles with a dot, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

48. Base fragment of a dish of grey ware painted in black inside with horizontal lines, of fine fabric. From a late level of Sub-period IB.

49. Base fragment of a dish of grey ware painted in black inside with an oblique line, of medium fabric, showing an oxidized core. From a late level of Sub-period IB.

50. Base fragment of a dish of grey ware painted in black inside with three semi-circles, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

51. Base fragment of a dish of grey ware painted in black inside with a bud or leaf motif, surmounted by a semi-circle, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

52. Base fragment of a dish of grey ware painted in black with three oblique lines, two of which are folded at the end, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

53. Base fragment of a bowl with a flat base in grey ware painted in black inside with a group of five bent lines thickened on one end joined by a semi-circular line below a bud shaped feature and a semi circle, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

54. Base fragment of a dish of grey ware painted in black inside with a thick horizontal band, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

55. Base fragment of a dish of grey ware painted in black inside with an uneven line, of fine fabric, showing an oxidized core. From an early level of Sub-period IB.

56. Base fragment of a dish of grey ware painted in black inside with roughly opposed triangles, of fine fabric, showing an oxidized core. From a mid-level of Sub-period IB.

57. Base fragment of a dish of grey ware painted in black inside with three vertical lines, of medium fabric, showing an oxidized core. From an early level of Sub-period IB.

58. Base fragment of a dish of grey ware painted in black inside with horizontal lines joined with semi-circles making a spiralled design and four dots in a line emanating from the centre, of fine fabric, showing an oxidized core. From a late level of Sub-period IB.

FIG. 33

(Also see fig. 21, nos. 26-27)

1. Fragment of a dish in black ware having a featureless rim, concave sides, showing a complete oxidized fine core, treated with a black slip. From an early level of Sub-period IB.

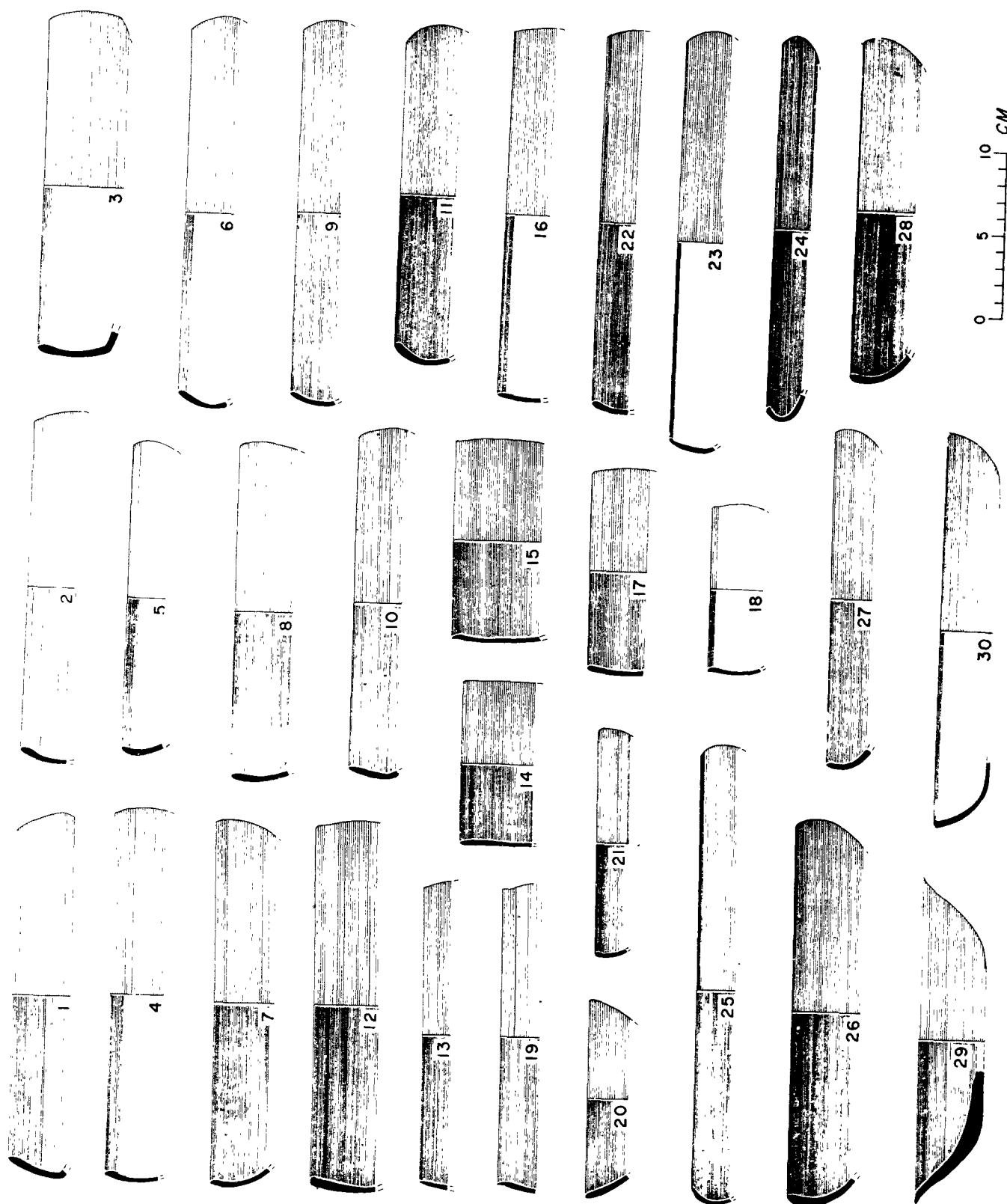


FIG. 33 : Black Ware, Sub-period IB.

2. Fragment of a dish in black ware with a slightly thickened featureless rim, having concave sides, showing a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
3. Fragment of a dish in black ware with a slightly thickened featureless rim, convex sides, showing well oxidized fine core with a black slip. From a late level of Sub-period IB.
4. Fragment of a bowl in black ware with a slightly thickened featureless rim, having concave sides with a well oxidized fine core, treated with a black slip. From an early level of Sub-period IB.
5. Small fragment of a bowl of black ware with a slightly thickened featureless rim, concave sides, having a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
6. Fragment of a dish of black ware with featureless rim, having concave sides, with a well oxidized core, treated externally with a black slip. From a late level of Sub-period IB.
7. Fragment of a dish of black ware with a featureless rim and concave sides, having a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
8. Fragment of a bowl in black ware with an almost featureless but slightly thickened rim, convex sides, with a well oxidized fine core, treated with a black slip. From an early level of Sub-period IB.
9. Fragment of a bowl in black ware having a featureless rim, concave sides, with a complete oxidized core, treated with a black slip. From a late level of Sub-period IB.
10. Fragment of a dish in black ware having featureless rim, slightly concave sides, with a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
11. Fragment of a bowl in black ware with a featureless rim, having concave sides, with a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
12. Fragment of a straight sided bowl in black ware, with a featureless thickened rim, showing a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
13. Straight sided bowl in black ware, with a featureless rim, showing a complete oxidized core, treated with a black slip. From a late level of Sub-period IB.
14. Straight sided bowl in black ware, with a slightly thickened featureless rim, showing a complete oxidized core, treated with a black slip. From a late level of Sub-period IB.
15. Fragment of a bowl in black ware, with a slightly out-turned rim and straight sides, showing a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
16. Fragment of a dish of black ware, with featureless rim and slightly incurved sides, showing a well oxidized core, treated with a black slip. From a late level of Sub-period IB.
17. Fragment of a bowl in black ware, with a featureless rim, having slightly incurved sides, showing an incomplete oxidized core, treated with a black slip. From a late level of Sub-period IB.
18. Fragment of a bowl in black ware with a slightly out-turned featureless rim, straight sides, with a well oxidized fine core, treated with a black slip. From a late level of Sub-period IB.
19. Fragment of a bowl in black ware having slightly out-turned rim with a well oxidized core, treated with a black slip. From a mid-level of Sub-period IB.
20. Convex sided a bowl in black ware with a slightly thickened featureless rim, having a well oxidized core, treated with a black slip. From a late level of Sub-period IB.
21. Fragment of a bowl in black ware, with a featureless rim, concave sides, a well oxidized core, treated with a black slip. From a late level of Sub-period IB.

22. Fragment of a bowl in black ware with a featureless rim, concave sides, well oxidized core, treated with a black slip. From a mid-level of Sub-period IB.

23. Fragment of a dish in black ware with a featureless rim, concave sides, a well oxidized core, treated with a black slip. From a mid-level of Sub-period IB.

24. Dish of black ware with featureless rim and convex sides, showing a well oxidized fine core, treated with a black slip. From a mid-level of Sub-period IB.

25. Dish of black ware with a featureless rim and concave sides, with a well oxidized fine core, treated with a black slip. From a mid-level of Sub-period IB.

27. Dish of black ware with a featureless rim and concave sides, showing a well oxidized fine core, treated with a black slip. From a mid-level of Sub-period IB.

28. Dish of black ware with a thickened featureless rim and concave sides, showing a well oxidized core, treated with a black slip. From a mid-level of Sub-period IB.

29. Dish of black ware, with a thickened base and sides, an incomplete oxidized coarse core, treated with a black slip. From a late level of Sub-period IB.

30. Dish of black ware with a thickened featureless rim and concave sides, showing a well oxidized fine core, treated with a black slip. From an early level of Sub-period IB.

CHAPTER IX

OTHER FINDS

- A) Beads**
- B) Bangles**
- C) Terracotta human figurines**
- D) Terracotta animal figurines**
- E) Terracotta Dabbers**
- F) Terracotta Balls**
- G) Terracotta Stoppers**
- H) Terracotta Skin-Rubbers**
- I) Ear Ornaments**
- J) Terracotta Wheels**
- K) Hopscotch Discs and Toy Cart frame**
- L) Terracotta Inderminate objects**
- M) Terracotta Miscellaneous objects**
- N) Bone and Ivory objects**
- O) Copper objects**
- P) Stone Balls**
- Q) Stone Querns and Pestles**

Madhu Bala

CHAPTER IX

OTHER FINDS

A. BEADS

The excavation has yielded two hundred and twenty-three beads including spaces and pendants. Out of these one hundred and fifty are made of terracotta. Other materials are agate, carnelian, faience, steatite, serpentine, lapis-lazuli, glass, copper, jasper, crystal, quartz, chalcedony, bone and shell.

Agate is represented by fifteen beads. Out of these, fourteen belong to Period IB and one bead belongs to Period IA. The main shapes are long barrel, truncated bicone, long cylindrical, standard convex and bicone.

Eight beads are of carnelian. Five beads belong to Period IB. Not a single bead could be collected in this material from IA. Three beads are unstratified including one tooth-shaped pendant and one bull shaped pendant which are remarkable. The general shapes are long barrel truncated circular, short barrel truncated circular, standard globular circular, etc.

Two glass beads are found from Period IB. One of these is a long convex eye-bead, the other one is a segmented eye-bead.

Sub-period-wise distribution of Beads classified according to material is as under :

<i>Sub-period</i>	<i>Terra-cotta</i>	<i>Faience</i>	<i>Copper</i>	<i>Agate</i>	<i>Carnelian</i>	<i>Glass</i>	<i>Jasper</i>	<i>Serpentine</i>	<i>Bone</i>	<i>Chalcedony</i>	<i>Crystal</i>	<i>Lapis-lazuli</i>	<i>Quartz</i>	<i>Steatite</i>
Unstratified	3	1	1	Nil	3	Nil	1	Nil	Nil	Nil	1	Nil	Nil	Nil
IB	127	27	1	14	5	2	3	1	2	1	1	1	1	2
IA	20	4	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

One crystal and one quartz beads are found from Period IB. The shape of both beads are long convex hexagonal.

One long barrel convex bead of serpentine from Period IB is also found.

Two beads of bone from Period IB are also found. One of these is a crescent-shaped pendant, others are long barrel circular beads.

Faience beads are thirty-two in total. Twenty-seven belong to Sub-period IB, four belong to Sub-period IA and one from an unstratified level. One of these is an animal shaped pendant. Two spacer beads having holes are also added to the good collection of beads. One banded faience bead is also found. The shapes are cylindrical tubular, bicone circular, long bicone truncated, *ghata*-shaped and standard gadrooned.

Two copper beads are found in total. Out of these one is from Sub-period IB and another is from an unstratified level. It is interesting to note that in terracotta, *ghata*-shaped is very common in Sub-period IB levels. This feature occurs in most of the Painted Grey Ware sites elsewhere also.

FIG. 34; PLS. XXV AND L

1. Carnelian : tooth-shaped pendant. From surface (BPR-4).
2. Carnelian : bull-shaped pendant. From an unstratified level (BPR-839).
3. Crystal: long, faceted, hexagonal bead. From a late level of Sub-period IB (BPR-381).
4. Agate: fragment of a long, barrel truncated, oblate bead. From a mid-level of Sub-period IB (BPR-799).
5. Bone: crescent shaped pendant. From a late level of Sub-period IB (BPR-623).
6. Faience: bull-shaped pendant (head and tail broken). From a mid-level of Sub-period IB (BPR-760).
7. Red jasper: long, barrel circular bead. From a mid-level of Sub-period IB (BPR-433).
8. Agate: standard, barrel truncated, oblate bead. From a late level of Sub-period IB (BPR-296).
9. Faience: spacer bead with nine horizontal holes. From a mid-level of Sub-period IB (BPR-499).
10. Steatite: Spacer bead with five horizontal holes. From a mid-level of Sub-period IB (BPR-504).
11. Carnelian: standard, bicone truncated, square bead. From a mid-level of Sub-period IB (BPR-818).
12. Serpentine: long, barrel (convex), oblate bead. From a late level of Sub-period IB (BPR-135).
13. Quartz: long, barrel truncated, hexagonal bead. From a late level of Sub-period IB (BPR-118).
14. Carnelian: short, cylindrical, truncated, circular bead. From a mid-level of Sub-period IB (BPR-752).
15. Agate banded: long, barrel, oblate bead. From a late level of Sub-period IB (BPR-331).
16. Agate: long, barrel, oblate bead. From a mid-level of Sub-period IB (BPR-503).
17. Agate banded: standard barrel, circular bead. From a late level of Sub-period IB (BPR-408).
18. Agate having circlets: long cylindrical circular bead. From an early level of Sub-period IB (BPR-715).
19. Agate having chocolate dots: long, barrel circular bead, From an early level of Sub-period IB (BPR-725).
20. Agate banded: long, barrel, circular bead. From a mid-level of Sub-period IB (BPR-420).
21. Glass: segmented eye bead. From a mid-level of Sub-period IB (BPR-743).
22. Glass: short, concav-convex, eye-bead with cloth impression. From a late level of Sub-period IB (BPR-199).
23. Quartz: long plano-convex, unfinished bead. From a mid-level of Sub-period IB (BPR-208).
24. Faience; long barrel circular bead. From a mid-level of Sub-period IB (BPR-706).
25. Faience: long, cylindrical, circular bead. From a mid-level of Sub-period IB (BPR-450).
26. Agate: long, barrel, circular bead. From a mid-level of Sub-period IB (BPR-205).
27. Agate: long barrel truncated circular bead. From a late level of Sub-period IB (BPR-49).
28. Agate banded: long, cylindrical circular bead. From an early level of Sub-period IB (BPR-165).
29. Faience banded: long, tubular, circular bead. From a mid-level of Sub-period IB (BPR-680).
30. Agate: long, cylindrical, circular bead. From a late level of Sub-period IB (BPR-626).

OTHER FINDS

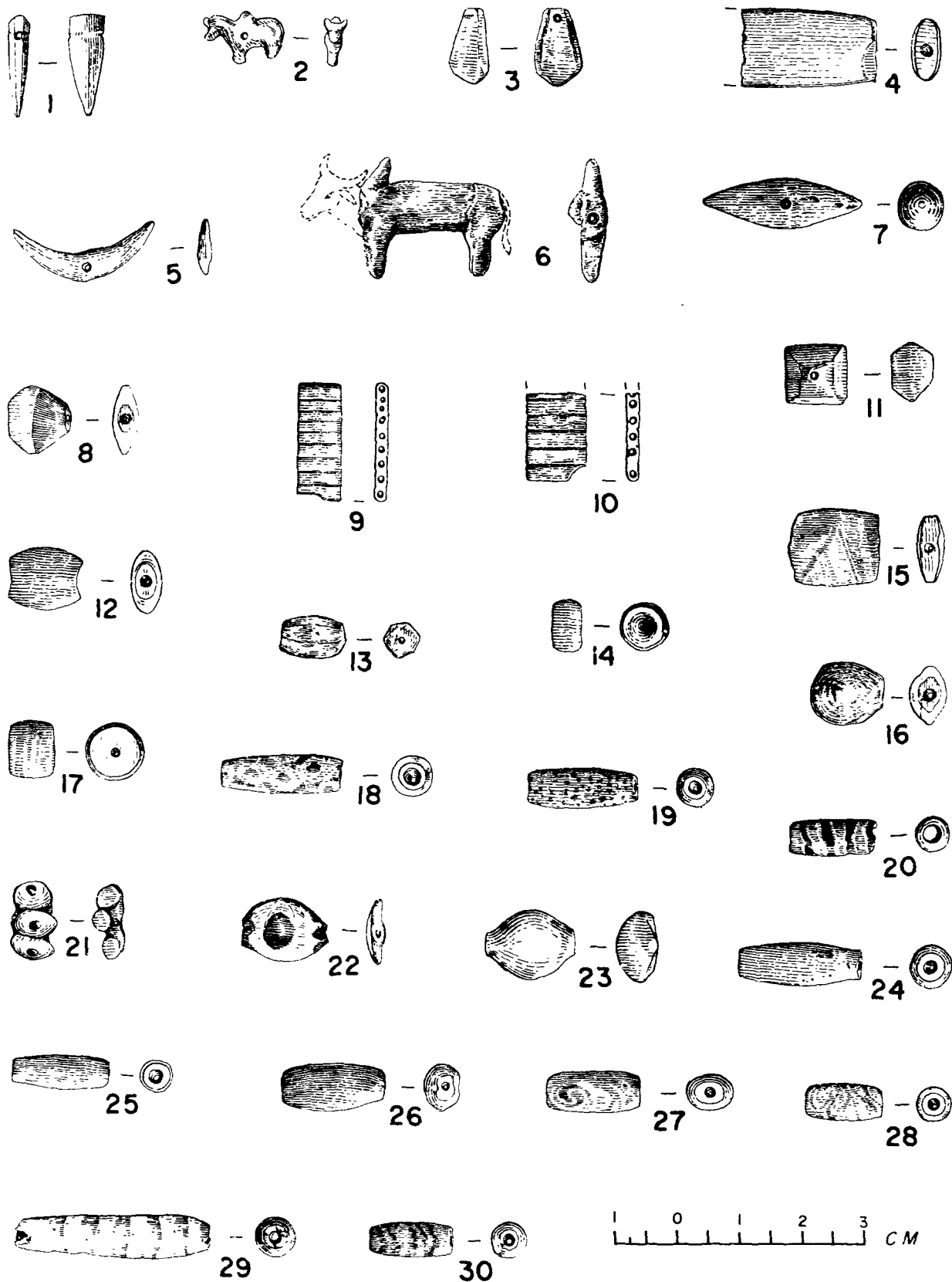


FIG. 34: Beads of semiprecious stones

FIG.35; PLS. XXVI AND M

1. Faience: long, cylindrical, circular bead. From a mid-level of Sub-period IB (BPR-763).
2. Faience: long, cylindrical, circular bead. From a mid-level of Sub-period IB (BPR-60).
3. Faience: long, barrel, circular bead. From a late level of Sub-period IB (BPR-655).
4. Faience: fragmentary, long, cylindrical, circular bead. From a mid-level of Sub-period IB (BPR-285).
5. Faience: long cylindrical bead, with incised decoration, circular. From a mid-level of Sub-period IB (BPR-680).
6. Faience: long, cylindrical, circular bead. From a mid-level of Sub-period IA (BPR-116).
7. Faience: long, cylindrical, circular bead. From a mid-level of Sub-period IB (BPR-796).
8. Faience: long, cylindrical bead. From a late level of Sub-period IB (BPR-801).
9. Faience: long, cylindrical, circular bead. From a mid-level of Sub-period IA (BPR-278).
10. Faience: long, barrel truncated, circular bead. From an early level of Sub-period IA (BPR-525).
11. Faience: long, cylindrical, circular bead having incised herring bone design. From an early level of Sub-period IB (BPR-600).
12. Faience: long, cylindrical, circular bead with incised oblique lines. From an early level of Sub-period IB (BPR-772).
13. Faience: long, cylindrical, circular bead. From an early level of Sub-period IB (BPR-274).
14. Faience: long, cylindrical circular bead. From a mid-level of Sub-period IB (BPR-696).
15. Faience: standard, cylindrical, circular incised bead. From a late level of Sub-period IB (BPR-11).
16. Steatite: Fragmentary spacer bead with four horizontal holes. From a mid-level of Sub-period IB (BPR-504-A).
17. Black jasper: unfinished, roughly faceted bead. From a late level of Sub-period IB (BPR-36).
18. Jasper: long, cylindrical, circular bead. From an early level of Sub-period IB (BPR-389).
19. Faience: long, barrel truncated, circular bead. From a late level of Sub-period IB (BPR-761).
20. Faience: short, bicone truncated circular bead. From a late level of Sub-period IB (BPR-50).
21. Agate banded: long, barrel truncated, circular bead. From a mid-level of Sub-period IB (BPR-515).
22. Faience: short, barrel truncated, circular bead. From a late level of Sub-period IB (BPR-38).
23. Faience: standard, bicone truncated, circular bead. From an early level of Sub-period IA (BPR-86).
24. Faience: short, barrel circular bead. From a mid-level of Sub-period IB (BPR-675).
25. Carnelian: standard, spherical, circular bead. From a late level of Sub-period IB (BPR-825).
26. Black jasper: short barrel, truncated, circular bead. From a mid-level of Sub-period IB (BPR-156).
27. Carnelian: short, bicone truncated, square faceted bead. From an unstratified level (BPR-365).
28. Agate: fragmentary, spherical, circular bead. From a late level of Sub-period IB (BPR-342).
29. Carnelian: short, bicone truncated, circular bead. From surface (BPR-15).
30. Copper: standard, globular, circular bead. From an unstratified level (BPR-13).
31. Faience: short, cylindrical bead. From an early level of Sub-period IB (BPR-783).
32. Faience: short, cylindrical circular bead. From a late level of Sub-period IB (BPR-55).
33. Bone: short, cylindrical, circular bead. From a mid-level of Sub-period IB (BPR-843).

OTHER FINDS

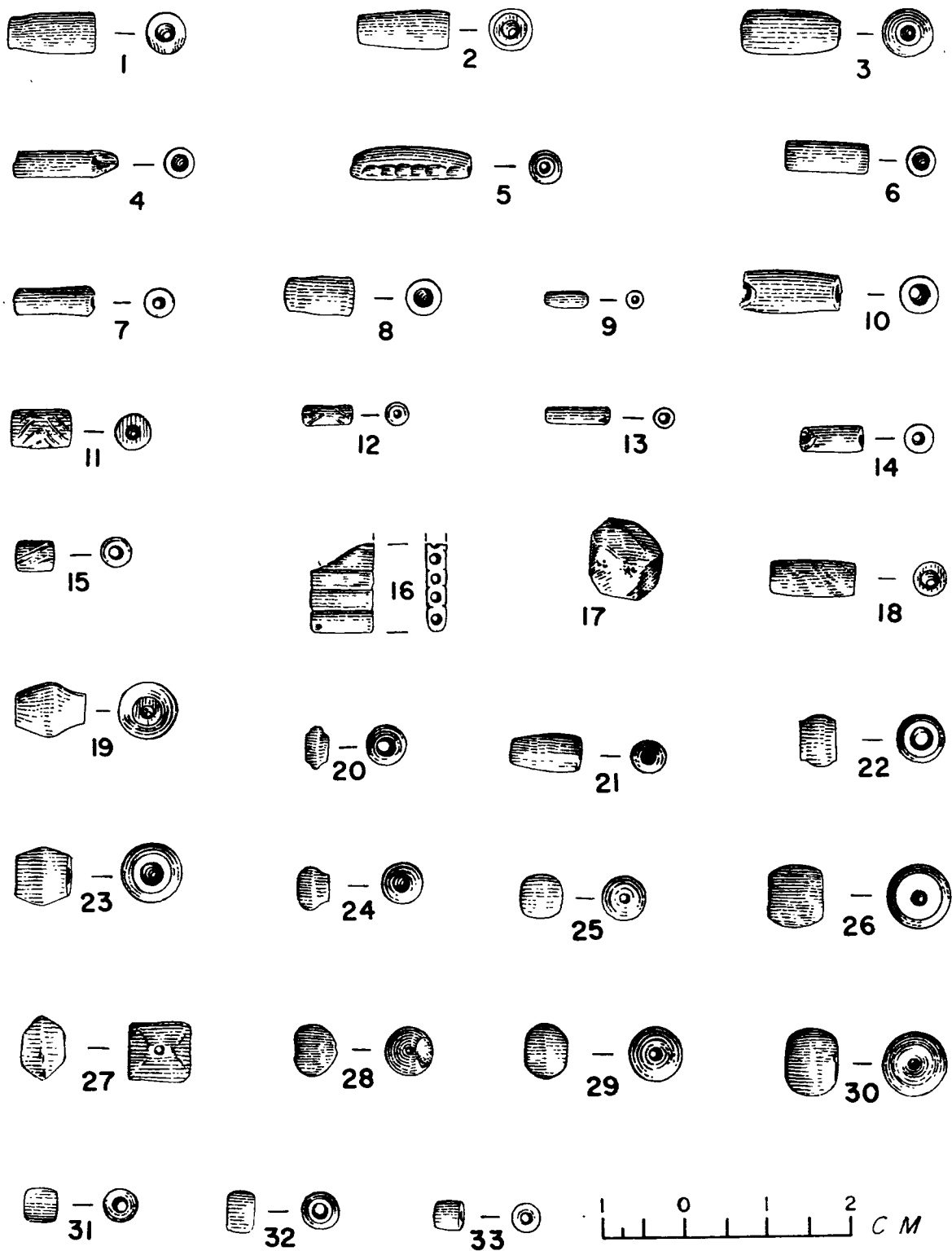


FIG. 35 : Beads of semiprecious stones

PLS. XXVII A AND N

1. Faience: standard, barrel, circular gadrooned bead. From a mid-level of Sub-period IB (BPR-806).
2. Faience: standard, barrel, circular, gadrooned bead. From an early level of Sub-period IB (BPR-728).
3. Faience: short, barrel, circular, decorated, gadrooned bead. From a mid-level of Sub-period IB (BPR-678).
4. Banded agate: long barrel, circular unfinished bead. From a mid-level of Sub-period IB (BPR-208).
5. Lapis-lazuli: fragment of a long rectangular, square bead. From a late level of Sub-period IB (BPR-858).

FIG. 36; PLS. XXVII B-XXVIII

1. Terracotta: Long unicone, circular bead decorated with incised lines. From an early level of Sub-period IB (BPR-768).
2. Terracotta: short, unicone, circular bead with deep incised lines. From a mid-level of Sub-period IB (BPR-C 50).
3. Terracotta: long unicone, circular bead with deep incised lines. From a mid-level of Sub-period IB (BPR-145).
4. Terracotta: long, arecanut shaped, circular bead. From a mid-level of Sub-period IB (BPR-550).
5. Terracotta: short, *ghata* shaped, circular bead. From a late level of Sub-period IB (BPR-554).
6. Terracotta: standard, *ghata* shaped, circular bead. From an early level of Sub-period IB (BPR-463).
7. Terracotta: long *ghata* shaped, circular bead. From a late level of Sub-period IB (BPR-21).
8. Terracotta: standard, *ghata* shaped, circular bead. From an early level of Sub-period IB (BPR-295).
9. Terracotta: long *ghata* shaped, circular bead. From a mid-level of Sub-period IB (BPR-336).
10. Terracotta: short, *ghata* shaped, circular bead. From a late level of Sub-period IB (BPR-441).
11. Terracotta: short, *ghata* shaped, circular bead. From a mid-level of Sub-period IB (BPR-157).
12. Terracotta: short, *ghata* shaped, circular bead. From a mid-level of Sub-period IB (BPR-158).
13. Terracotta: standard, *ghata* shaped, circular bead. From a mid-level of Sub-period IB (BPR-564).
14. Terracotta: short *ghata* shaped, circular bead. From a late level of Sub-period IB (BPR-219).
15. Terracotta: short, bicone, truncated, circular bead. From a mid-level of Sub-period IB (BPR-424).
16. Terracotta: short, bicone, truncated, circular bead. From an early level of Sub-period IB (BPR-527).
17. Terracotta: short, bicone, truncated, circular bead. From a mid-level of Sub-period IB (BPR-770).
18. Terracotta: short, bicone, truncated, circular bead. From a late level of Sub-period IB (BPR-865).
19. Terracotta: short, barrel, truncated circular bead. From a mid-level of Sub-period IB (BPR-275).
20. Terracotta: short, convex, truncated cone, circular bead. From a late level of Sub-period IB (BPR-284).
21. Terracotta: short, barrel, circular bead. From an early level of Sub-period IB (BPR-651).
22. Terracotta: short, bicone truncated, circular bead. From a mid-level of Sub-period IB (BPR-99).
23. Terracotta: short, bicone, truncated, circular bead. From an early level of Sub-period IB (BPR-771).
24. Terracotta: short, bicone, truncated, circular bead. From a late level of Sub-period IB (BPR-8).

OTHER FINDS

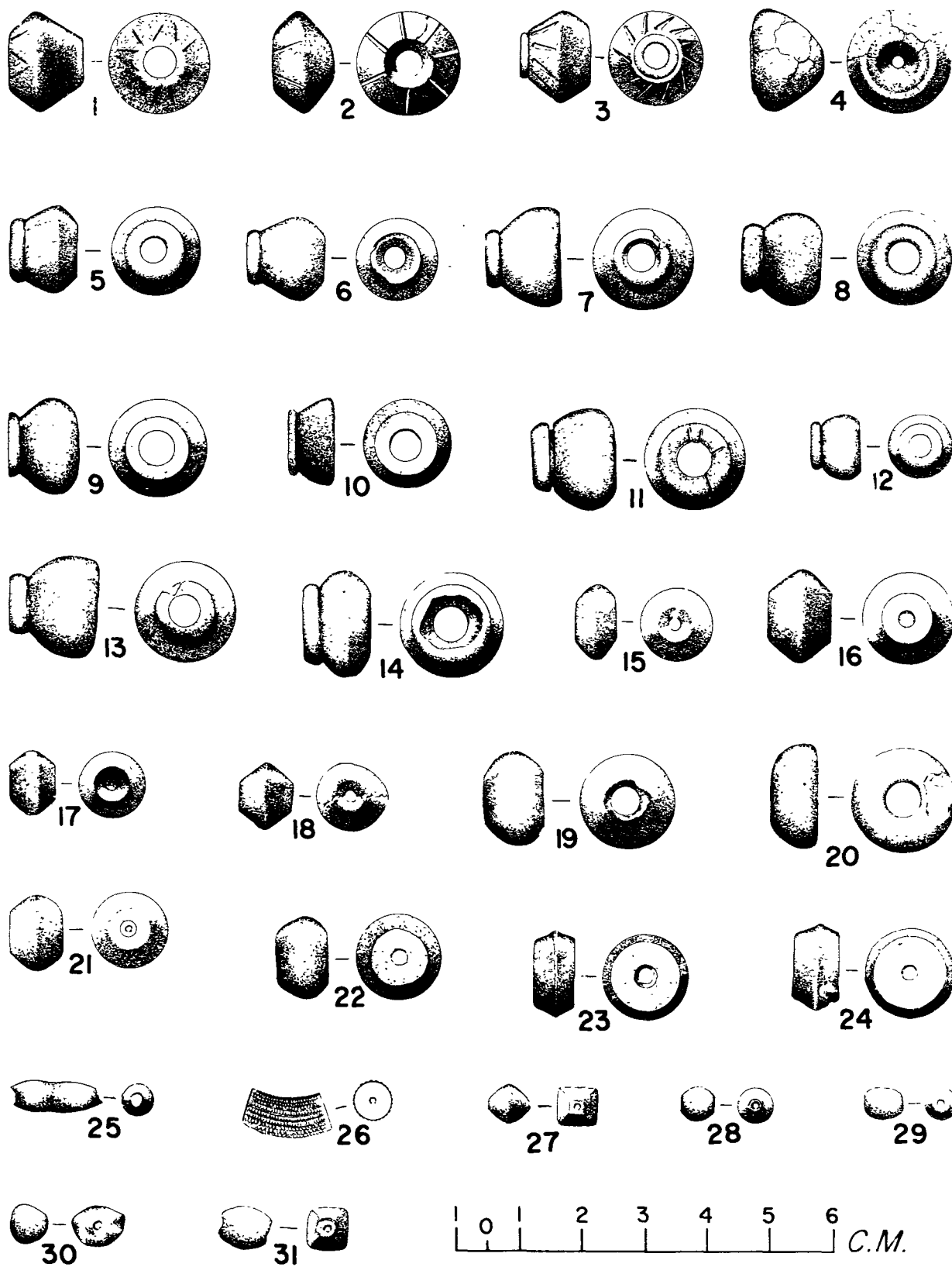


FIG. 36 : Terracotta beads

25. Terracotta: long circular bead. From a late level of Sub-period IA (BPR-70).
26. Terracotta: spacer/pendant with an incised beaded design. From a late level of Sub-period IB (BPR-3).
27. Terracotta; standard, bicone, square faceted bead. From a late level of Sub-period IB (BPR-367).
28. Terracotta: standard, barrel, circular bead. From a mid-level of Sub-period IB (BPR-822).
29. Terracotta: long barrel, circular bead. From a mid-level of Sub-period IB (BPR-384).
30. Terracotta: uneven, globular bead with a perforation. From a mid-level of Sub-period IB (BPR-428).
31. Terracotta: standard, square, faceted bead. From surface (BPR-183).

B. BANGLES (PLS. XXIX AND O)

The excavation at Bhagwanpura has yielded more than one hundred and twenty four bangle pieces from different levels. Faience bangles are the largest in number than bangles in other materials. The materials consists of faience, glass, terracotta, bone and copper. The occurrence of glass bangles from Sub-period IB is remarkable. Glass has been found in various colours e.g., blue, black and white. A silver or gold coloured coating is also found applied on the glass bangles.¹ The bangles are triangular circular, rectangular and square in the section. Bangles have been divided in three categories; *Kangans*, bracelets and bangles. The material and period-wise distribution is as below:

<i>Sub-period</i>	<i>Faience</i>	<i>Glass</i>	<i>Terracotta</i>	<i>Bone</i>	<i>Copper</i> ²	<i>Total</i>
IB	78	9	11	1	1	100
IA	21	Nil	3	Nil	Nil	24

The selected specimens are as below:

1. Glass : fragment of a *kangan* having a ridge in the centre, blue in colour, translucent, coated with a silver colour, triangular in section 2.7-3 cm in dia.³ From a mid-level of Sub-period IB (BPR-425).
2. Glass : fragment of a *kangan* having a ridge in the centre, bluish in colour, translucent, highly coated with a silver colour, rangular in section 3.50-4 cm in dia. From a mid-level of Sub-period IB (BPR-712).
3. Glass : fragmentary *kangan*, blue in colour, decorated with incisions on the surface, coated with a silver colour, convex in seccion 4.5-4 cm in dia. From a mid-level of Sub-period IB (BPR-406).
4. Faience : fragment of bangle decorated with incised lines and roughly round in section, 5.5 cm in dia. From a mid-level of Sub-period IB (BPR-721).

¹ See B.N. Tandon, 'Analysis of Glass from Bhagwanpura'.

² See also 'Examination of Metallic Samples of Bhagwanpura'.

³ The inner and outer diameters have been given respectively.

OTHER FINDS

5. Glass : fragment of *kangan* with a ridge black in colour, opaque, coated in silver colour. triangular in section, 5-4.5 cm. on dia. From a mid-level of Sub-period IB (BPR-245).
6. Glass : fragment of a *kangan*, black in colour, opaque, coated with a silver and gold colour, giving a lustre, triangular in section 4-5.5 cm. in dia. From a mid-level of Sub-period IB (BPR-459).
7. Glass : fragment of a *kangan* white in colour, translucent in section 3.4-4 cm. in dia. From a mid-level of Sub-period IB (BPR-605).
8. Glass : fragment of a *kangan*, white in colour, coated with a silver colour, giving a fine lustre, triangular in section 2.35-3 cm. in dia. From an unstratified level (BPR-838).
9. Terracotta: fragment of a bangle with a ridge, pentagonal in section 2.50-3 cm. in dia. From a late level of Sub-period IB (BPR-217).
10. Terracotta: fragment of a bangle, circular in section 2.35-3.35 cm. in dia. From an early level of Sub-period IB (BPR-511).
11. Terracotta: fragment of a terracotta bangle with ridges, pentagonal in section 2.20-3 cm. in dia. From a late level of Sub-period IB (BPR-827).
12. Terracotta: fragment of a bangle, with ridges, pentagonal in section 3-3.70 cm. in dia. From a late level of Sub-period IB (BPR-221).
13. Terracotta: fragment of a bangle with a design on one side, round in section 3.75-4.6 cm. in dia. From a late level of Sub-period IB (BPR-56).

PL. XXX A

1. Faience : fragment of a bracelet, decorated with incised lines, bluish green in colour, concave in section 3-3.2 cm. in dia. From an early level of Sub-period IB (BPR-248).
2. Faience : fragment of a *kangan*, decorated, bluish green in colour, rectangular in section 3.15-3.50 cm. in dia. From a mid-level of Sub-period IB (BPR-508).
3. Faience : fragment of a bracelet, decorated with incisions, bluish green in colour, rectangular in section 3-3.2 cm. in dia. From a mid-level of Sub-period IB (BPR-443).
4. Faience : fragment of a bracelet, decorated, bluish green in colour 3-3.2 cm. in dia. From an early level of Sub-period IB (BPR-710).
5. Faience : fragmentary bracelet, decorated, bluish green in colour, concave in section, 3-3.5 cm. From a mid-level of Sub-period IB (BPR-697).
6. Faience : fragment of a bracelet, decorated with a herring bone pattern, light bluish green in colour, rectangular in section 3-3.3 cm. From a mid-level of Sub-period IB (BPR-718).
7. Faience : fragment of a bangle, light bluish green in colour, square in section. From a mid-level of Sub-period IB (BPR-672).
8. Faience : fragment of a bracelet, decorated with incised lines, bluish green in colour, rectangular in section 4-4.3 cm. in dia. From a mid-level of Sub-period IB (BPR-469).
9. Faience : fragment of a *kangan*, decorated with incised lines, bluish green in colour, ovoid in section 4-4.70 cm. in dia. From a late level of Sub-period IA (BPR-873) .

10. Faience : fragment of a *kangan*, decorated with oblique incised lines. light bluish green in colour, ovoid in section 4-4.85 cm. in dia. From a late level of Sub-period IB (BPR-529).
11. Faience : fragment of a bangle, decorated with incised lines, light bluish green in colour, square in section 3-3.5 cm. in dia. From a mid-level of Sub-period IB (BPR-721).
12. Faience : fragment of a bangle, decorated with incised line, light bluish green in colour 2.70-3.2 cm. in dia. From a late level of Sub-period IB (BPR-647).

C. TERRACOTTA HUMAN FIGURINES

The excavation has yielded seven human figurines in all. These are all in anthropomorphic⁴ form except one. Three belong to Sub-period IA and three from Sub-period IB and one comes from surface. Generally these are hand-made. The material of these is terracotta and pottery in grey colour. The illustrated examples are as follows :

PL. XXX B

1. Terracotta: upper part of an anthropomorphic figure with one arm intact other broken, decorated with finger impressions, lower portion broken, hand-made. From a late level of Sub-period IB (BPR-833).
2. Pottery : Violin-shaped mother goddess (?) made out of a grey sherd. From a mid-level of Sub-period IB (BPR-259).
3. Terracotta: Upper portion of an anthropomorphic figure, one arm missing, other broken, hand-made. From a mid-level of Sub-period IA (BPR-834).
4. Terracotta: lower portion of an anthropomorphic figure (?) with two wide spread legs, upper portion missing, hand-made. From a mid-level of Sub-period IA (BPR-302).
5. Violin-shaped mother goddess made out of a grey sherd with a hole on the top, probably used as a pendant. From surface (BPR-224).
6. Terracotta: lower portion of a seated deity (?) on a stand, black in colour. From a mid-level of Sub-period IA (BPR-298).

D. TERRACOTTA ANIMAL FIGURINES

The excavation has yielded thirty five animal and bird figurines from different levels of Sub-period IA and IB. All the figurines are hand-modelled. An analysis of the various figures have revealed that bulls were popular in Sub-period IA and rams have been found in a large number in Sub-period IB. Besides this, the tradition of incised designs on terracotta animal figures and birds was a specific trait associated with the terracotta art of Sub-period IB (overlap period). In this connection, it may be

⁴ Anthropomorphic figures are available from Balambat in Gandhara Grave Culture in Pakistan. A.H. Dani, *op. cit.*, pls. LI-LIII.

OTHER FINDS

mentioned that incised terracotta ram has also been reported from the Painted Grey Ware level at Alamgirpur (U.P.)⁵. Incised terracotta bird from Noh, and a bird with incised notched design from Thapli⁶ is worth mention besides the terracotta ram with incised decoration from Jakhera has a great similarity with the example from Bhagwanpura. Like Bhagwanpura one, Jakhera ram has also holes for fixing wheels⁷.

The terracotta animal figurines of Period IB are predominantly wheeled, perhaps a legacy of the late Harappan contact. In the early level of Sub-period IA, a few terracotta have been found which are highly fired and turned grey to black. The bulls of this period are stylized with long horns.

FIG.37; PL. XXXI

1. Terracotta: standing ram with folded horns, decorated with incised lines on the body and legs having holes in the legs and nostrils probably for putting wheels and a string. From a late level of Sub-period IB (BPR-598).
2. Terracotta: head of a ram with folded horns. From an early level of Sub-period IB (BPR-409).
3. Terracotta: standing ram with folded horns (broken) decorated with incised groups of oblique lines on body and legs having holes in legs and nostrils probably for inserting wheels and a string. From a late level of Sub-period IB (BPR-599).
4. Terracotta: standing ram with folded horns decorated with incised oblique lines on the body and legs, one front leg and horns are broken, having holes in legs and nostrils probably for putting wheels and a string. From a late level of Sub-period IB (BPR-597).
5. Terracotta: hind portion of an animal with broken legs, having incised lines on the body and legs. From a late level of Sub-period IB (BPR-780).
6. Terracotta: bird, hollow from inside (probably rattle), having oblique and criss-cross incised designs on the body. From an early level of Sub-period IB (BPR-281).

PL. XXXII

1. Terracotta: dog with prick ears and short legs, tail and one ear broken. From a mid-level of Sub-period IB (BPR-737).
2. Terracotta: head portion of a spotted deer, right horn missing, decorated with punched circlets. From an early level of Sub-period IB (BPR-537).
3. Terracotta: bull with pinched up hump, left horn damaged, both of the hind legs missing. From an early level of Sub-period IA (BPR-169).

⁵ *Indian Archaeology 1958-59 - A Review*, Pl. LXII (II), p. 54.

⁶ *Indian Archaeology 1968-69 - A Review*, pp. 28-29.

K.P. Nautiyal, B.M. Khanduri, Vinod Nautiyal, D.L. Rajput and R.K. Bhatt, 'Painted Grey Ware Culture in Garhwal Himalayas : New Evidence and Interpretation' *Puratattva*, no. 17, p. 12.

⁷ *Indian Archaeology 1985-86 - A Review*, p. 81, PL. XXVII.

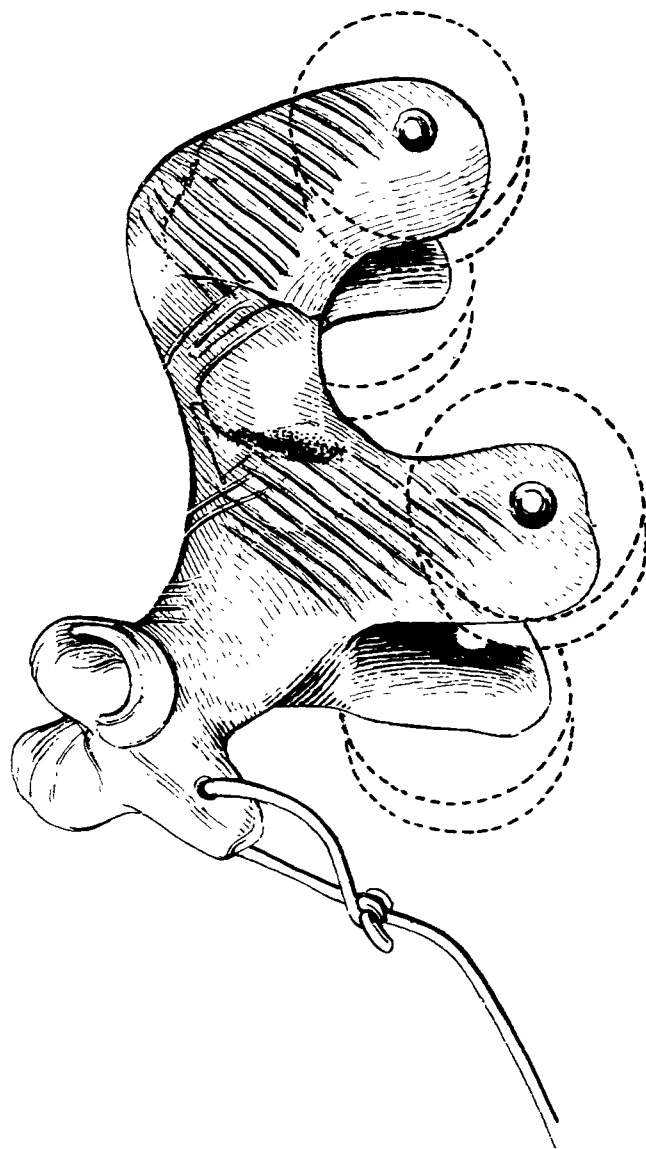


FIG. 37 : Terracotta wheeled ram (restored)

OTHER FINDS

4. Terracotta: small dog, face turned to right side having a small bushy tail. From a mid-level of Sub-period IB (BPR-713).
5. Terracotta: fragmentary head of an animal with broken horns. From a mid-level of Sub-period IB (BPR-412).
6. Terracotta: standing animal figure (bear?), with prominent legs, having holes in legs for fastening wheels and a central transverse hole for putting a string; eyes and mouth are indicated by holes. From a late level of Sub-period IB (BPR-747).
7. Terracotta: bovine, left horn damaged, face having holes. From a late level of Sub-period IB (BPR-576).
8. Terracotta: head of a bull, with stylised horns and face. From a mid-level of Sub-period IA (BPR-168).

E. TERRACOTTA DABBERS

Ten terracotta dabbers have been recovered from excavation. These are both in big and small sizes. These are available from Sub-period IB. Not a single dabber could be collected from Sub-period IA. One thing is very interesting to note that there are two dabbers in big size having marks akin to plus and minus marks on the handle. The significance of these, is difficult to conjecture.

PL. XXXIII A

1. Terracotta: dabber, with a handle having an incised mark akin to minus sign. From a mid-level of Sub-period IB (BPR-146).
2. Terracotta: dabber, with a handle having an incised mark akin to plus sign. From a late level of Sub-period IB (BPR-319).

F. TERRACOTTA BALLS

Twenty two balls, made of terracotta, have been unearthed from the excavation. Amongst these, seven belongs to Sub-period IA, seven from IB and eight from unstratified levels. These are all in different sizes and weights. What was the purpose of these small and big balls? Whether these were used for playing by children or used as weights or for killing the birds, it is not clear.

PL. XXXIII B

The illustrated specimens are as below :

1. Terracotta: ball, spherical, 2.7 cm. in dia. From a late level of Sub-period IB (BPR-336).
2. Terracotta: ball, spherical, 2.9 cm. in dia. From a mid-level of Sub-period IB (BPR-780).
3. Terracotta: ball, spherical, dia. 2.9 cm. From a late level of Sub-period IB (BPR-225).

4. Terracotta: ball, broken, uneven, roughly spherical, dia. 3 cm. From a late level of Sub-period IB (BPR-338).
5. Terracotta: ball, spherical, 2.5 cm in dia. From a mid-level of Sub-period IB (BPR-764).
6. Terracotta: ball, spherical, 1.3 cm in dia. From a late level of Sub-period IB (BPR-8).
7. Terracotta: ball, broken, spherical, 2.3 cm in dia. From a late level of Sub-period IB (BPR-40).
8. Terracotta: ball, black in colour, spherical, 2 cm in dia. From an early level of Sub-period IB (BPR-44).
9. Terracotta: ball, spherical, dia. 1.9 cm From a late level of Sub-period IB (BPR-8).
10. Terracotta: ball, spherical, dia. 2 cm From a late level of Sub-period IB (BPR-41).
11. Terracotta: ball, spherical 2 cm. in dia. From a late level of Sub-period IB (BPR-422).
12. Terracotta: ball, broken, spherical, dia. 1.6 cm From a late level of Sub-period IA (BPR-474).
13. Terracotta: ball, spherical, dia. 1.4 cm From a mid-level of Sub-period IB (BPR-429).
14. Terracotta: ball, spherical, 1.7 cm in dia. From a late level of Sub-period IB (BPR-472-A).

G. TERRACOTTA STOPPERS

Only seven terracotta stoppers could be collected during the excavations. All these belong to Sub-period IB. No stopper could be recovered from Sub-period IA. All these are circular in shape, having a knob. The illustrated specimens are as below :

PL. XXXIV

1. Terracotta: stopper, with a knob, hand made, grey in colour, circular in shape. From a late level of Sub-period IB (BPR-128).
2. Terracotta: stopper, with a knob, hand made, brown in colour, roughly circular in shape. From a late level of Sub-period IB (BPR-12).
3. Terracotta: stopper, with a knob, hand made, greyish in colour, circular. From a mid-level of Sub-period IB (BPR-382).
4. Terracotta: stopper, with a knob, hand made, grey in colour, circular, having a depression in the centre. From a late level of Sub-period IB (BPR-83).

H. TERRACOTTA SKIN-RUBBERS

The excavation has yielded thirteen skin-rubbers. Amongst these twelve belongs to Sub-period IB and one to Sub-period IA. Most of these are in good condition. There are few which appears to have been used due to apparent wear and tear of the surface.

PL. XXXV A

1. Terracotta: skin-rubber, rectangular, length 11.7 cm, breadth 8.8 cm and thickness 2 cm. From a late level of Sub-period IB (BPR-230).

OTHER FINDS

2. Terracotta: Skin-rubber, rectangular, length 9.8 cm., breadth 6 cm. and thickness 2 cm. From a mid-level of Sub-period IB (BPR-402).
3. Terracotta: Skin-rubber, Rectangular, length 8.9 cm., breadth 6.5 cm. and thickness 2.4 cm. From a late level of Sub-period IB (BPR-147).
4. Terracotta: Skin-rubber, rectangular, length 10 cm., breadth 7 cm. and thickness 2.7 cm. From a late level of Sub-period IB (BPR-561).

I. EAR-ORNAMENTS

Pl. XXXV B

The excavation has yielded seven ear-ornaments. Amongst these, one is made of bone and the remaining are of terracotta. All these belong to Sub-period IB. Not a single ear-ornament could be collected from Sub-period IA. The illustrated specimens are as follows :

1. Bone: ear-ornament, polished, circular with a hole. From a late level of Sub-period IB (BPR-139).
2. Terracotta: ear-ornament, polished, circular. From a mid-level of Sub-period IB (BPR-286).
3. Terracotta: ear-ornament, unpolished, circular. From a mid-level of Sub-period IB (BPR-545).
4. Terracotta: ear-ornament, polished, circular. From a mid-level of Sub-period IB (BPR-689).

J. TERRACOTTA WHEELS

Thirty-one terracotta wheels have been found from the excavation at Bhagwanpura. Only three wheels belong to Sub-period IA. Twenty eight are from Sub-period IB and five are from unstratified levels. The purpose of the wheels was probably for fixing these to toy-carts of the children. All these are hand-made.

It is interesting to note that all the three wheels which came from Sub-period IA are having hub. The period-wise distribution is as under:

<i>Sub-period</i>	<i>Wheels without hub</i>	<i>Wheels with hub</i>
IB	10	18
IA	Nil	3

Pl. XXXVI

The selected specimens are as below :

1. Terracotta: wheel, with a prominent hub, plano-convex, dia. 15.8 cm., thickness 3.2 cm. From a mid-level of Sub-period IB (BPR-667).
2. Terracotta: wheel, with a prominent hub, painted in black, plano-convex, dia. 7.8 cm., thickness 3.2 cm. From a late level of Sub-period IB (BPR-635).

3. Terracotta: wheel, plano-convex, dia. 5.1 cm, thickness 4 cm. From an early level of Sub-period IB (BPR-272).
4. Terracotta: wheel, convex, 4.5 cm in dia., thickness 1.4 cm. From a late level of Sub-period IB (BPR-59).
5. Terracotta: wheel, fragmentary with a hub, plano-convex, 10.2 cm in dia., thickness 2.1 cm From a mid-level of Sub-period IB (BPR-484).
6. Terracotta: wheel, having a hub, plano-convex, 4.7 in dia., 2.1 cm in thickness. From a late level of Sub-period IB (BPR-612).
7. Terracotta: wheel, with a prominent hub, plano-convex, dia. 8.2 cm, thickness 2 cm From a mid-level of Sub-period IA (BPR-423) .
8. Terracotta: wheel, fragmentary with a hub, plano-convex, 14.3 cm in dia., 2.3 cm in thickness. From a late level of Sub-period IA (BPR-81).

K. HOPSCOTCH DISCS AND TOYCART FRAME

Only thirty seven discs and hopscotches have been found from the excavations. Amongst these, a few are made of the sherds of Painted Grey Ware. All are circular in shape. Some of these are decorated also. The selected specimens are as below :

PL. XXXVII

1. Terracotta: disc with incised decoration on the edges, circular. From a late level of Sub-period IB (BPR-11).
2. Terracotta: disc black in colour, having incised decoration on edges of both sides and centre, circular. From an early level of Sub-period IB (BPR-586)⁸.
3. Terracotta: disc with incised design on the edges, circular. From a late level of Sub-period IB (BPR-552).
4. Pottery : hopscotch of Painted Grey Ware sherd with a black paintings. From a late level of Sub-period IB (BPR-129).
5. Terracotta: hopscotch, circular. From a mid-level of Sub-period IB (BPR-129).
6. Pottery : hopscotch of Painted Grey Ware sherd, with a painting in black. From a late level of Sub-period IB (BPR-591).
7. Pottery : hopscotch of Painted Grey Ware sherd, with a painted designs in black. From an early level of Sub-period IB (BPR-540).
8. Terracotta: fragment of a toy cart-frame with two holes, rectangular. From a mid-level of Sub-period IB (BPR-123).
9. Pottery : hopscotch of Painted Grey Ware sherd. From a mid-level of Sub-period IB (BPR-411).

⁸ Also found at Hastinapura and Jodhpura, from the PGW levels.

L. TERRACOTTA INDETERMINATE OBJECTS

Pl. XXXVIII A

Two indeterminate terracotta objects (both fragmentary) have been found from the middle levels of Sub-period IB. Out of these, the better preserved object is described below :

Terracotta indeterminate object, having a height of 14 cm, basal width of 14 cm and a breadth of 8 cm., is broken on the lower side. It tapers from top to bottom. The top is bifurcated in two parts. It is hand modelled. The clay has a mixture of husk and reed. It is well fired. On the basis of similar objects found at Bara, Sanghol and Hulas, one is inclined to put the narrower bifurcated end at the top and the broader end at the bottom. The purpose of the object appears to be ritualistic⁹. It was found near the oval structure VI. From a mid-level of Sub-period IB (BPR-878).

M. TERRACOTTA MISCELLANEOUS OBJECTS

Pl. XXXVIII B

1-3. Terracotta: three fragmentary objects, almost flat on both sides, having a hole in the centre which is wider on the top, may be due to rotating of a rod(?) are available. From an early level of Sub-period IA. The measurements of the three objects are $7 \times 7 \times 2.6$ cm, $12 \times 6.5 \times 2.5$ cm and $5.5 \times 4.5 \times 2.3$ cm respectively (BPR-77, 90 and 189).

Terracotta: two fragments of a footed *Chakla* have been found, one is from early level of Sub-period IA and the other from late levels of Sub-period IB.

4. Terracotta: footed fragmentary *chakla* with one foot intact having a height of 6 cms. from an early level of Sub-period IA (BPR-780).

5. Terracotta: piece with reed marks.

Terracotta piece, length 8.5 cm, width 6 cm, breadth 2.5 cm with reed marks and two holes, use indeterminate. From an early level of Sub-period IB (BPR-553).

6. Terracotta Crucible.

The excavation has yielded two crucibles and one is illustrated below :

Terracotta: hand-made fragmentary crucible height 3.8 cms. From a mid-level of Sub-period IB (BPR-866).

N. BONE AND IVORY OBJECTS

The excavation has yielded about one hundred and fourteen objects made of bone and ivory. Amongst these eighty nine belong to Sub-period IB and remaining are from unstratified levels. Not a single object could be collected from Sub-period IA. The objects are : awls, knitting needles, bangles,

spetulas pendant and styli. The number of styli have been larger than other objects. All the objects have well smoothened polished surface. The use of styli, whether for writing or some other purpose, is yet to be ascertained. It has been noticed that in one of the stylus there is a prominent black mark on the tip. The selected specimens are as below :

FIG. 38; PL. XXXIX

1. Bone : kohl-stick (?) round in section, length 14.3 cm From a mid-level of Sub-period IB (BPR-270).
2. Bone : knitting needle; with top divided by an incised line, polished, circular in section length 14.5 cm From a late level of Sub-period IB (BPR-688).
3. Bone : stylus, well polished, round in section, length 7.9 cm From a late level of Sub-period IB (BPR-653).
4. Bone : stylus slightly polished, in black colour, circular in section, length 7.3 cm. From an early level of Sub-period IB (BPR-485).
5. Bone : *kalam* thick, roughly circular in section, length 8 cm From surface (BPR-849).
6. Bone : stylus, polished, circular in section, length 4.8 cm From a late level of Sub-period IB (BPR-473).
7. Bone : arrow head, polished, circular in section, length 6.9 cm From an early level of Sub-period IB (BPR-465).
8. Bone : needle with grooves on top, circular in section, length 6.1 cm From an early level of Sub-period IB (BPR-297).
9. Bone : stylus (?) unfinished, circular in section, length 8.5 cm. From a late level of Sub-period IB (BPR-340).
10. Bone : fragment of a knitting needle having a top divided by incised lines and round in section, length 4.7 cm From a late level of Sub-period IB (BPR-668).
11. Bone : stylus, polished, circular in section, length 7.5 cm From a mid-level of Sub-period IB (BPR-746).
12. Bone : arrow head, polished, length 6.1 cm From a late level of Sub-period IB, roughly circular in section (BPR-39).
13. Bone : stylus, black, circular in section, length 6.2 cm From a late level of Sub-period IB (BPR-407).
14. Bone : fragment of a stylus, fluted, having black point on the tip, circular in section, length 2 cm From a mid-level of Sub-period IB (BPR-682).
15. Bone : fragment of a stylus (?) polished, circular in section, length 2.8 cm From a late level of Sub-period IB (BPR-446).
16. Bone : fragment of a stylus (?) polished, circular in section, length 2 cm From an early level of Sub-period IB (BPR-449).
17. Bone : fragment of a spetula, polished, length 8.5 cm From a late level of Sub-period IB (BPR-861).
18. Bone : stylus, polished, circular in section, length 5 cm. From a late level of Sub-period IB (BPR-207).

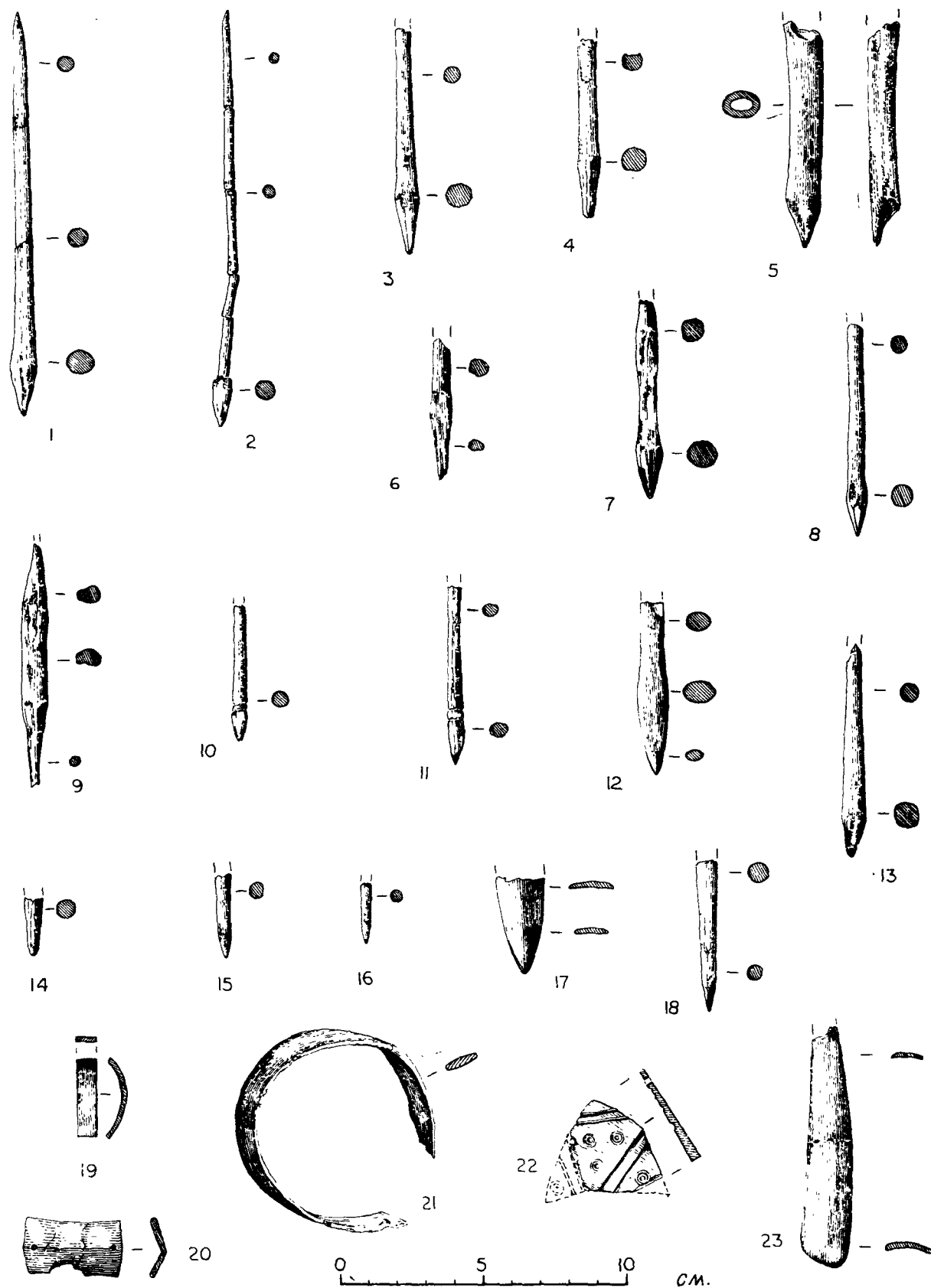


FIG. 38 : Bone and ivory objects

19. Bone : fragment of a polished bangle, rectangular in section. From a late level of Sub-period IB (BPR-643).
20. Bone : pendant, with two holes on both the ends. From a late level of Sub-period IB (BPR-148).
21. Bone : bangle with two holes on both ends, convex in section, dia. 3.5 cm. From a late level of Sub-period IB (BPR-609).
22. Ivory (?) : stylized human shaped pendant decorated with circlets and incisions. From a mid-level of Sub-period IB (BPR-143).
23. Bone : fragment of a spatula (?) polished, length 3.4 cm. From a late level of Sub-period IB (BPR-859).

O. COPPER OBJECTS

In all sixty copper objects have been recovered from the excavation. All belong to Sub-period IB except one. The objects include : rod, blade, needle, bangle, ring, dagger, coil, etc. The illustrated examples are as follows :

Pl. XL

1. Copper: needle with an eye, round in section, length 11.7 cm From a late level of Sub-period IB (BPR-747).
2. Copper: nail-parer, flattened at the working end, length 11 cm. From a late level of Sub-period IB (BPR-528).
3. Copper: fragment of a dagger, rectangular in section, length 6.3 cm From a late level of Sub-period IB (BPR-585).
4. Copper: borer, round in section, length 5.07 cm. From a late level of Sub-period IB (BPR-654).
5. Copper: spike, square in section, length 6.5 cm. From a mid-level of Sub-period IB (BPR-676).
6. Copper: antimony rod, round in section, length 6.8 cm. From a late level of Sub-period IB (BPR-602).
7. Copper: antimony rod, thickened from one side, bended from the centre, round in section, length 10.5 cm. From a mid-level of Sub-period IB (BPR-61).
8. Copper: antimony rod, round in section, length 6 cm. From a late level of Sub-period IB (BPR-196).
9. Copper: small bangle, circular in section, 4 cm in diameter. From an early level of Sub-period IB (BPR-57).
10. Copper: coil, round in section, 1 cm in dia. From an early level of Sub-period IB (BPR-863).
11. Copper: nail-parer, round in section, length 15 cm. From a mid-level of Sub-period IB (BPR-863).

P. STONE BALLS

PL. XLI

Eight stone balls have been recovered from the different levels of excavation. One is from Sub-period IA and the remaining belong to Sub-period IB. The purpose of the stone balls might be for killing animals or were used as weights. They are all globular in shape.

The illustrated examples are as below :

1. Stone: ball, globular, 6 cm. in dia. From a late level of Sub-period IB (BPR-228).
2. Stone: ball, globular 4.7 cm. in dia. From a late level of Sub-period IB (BPR-481).
3. Stone: ball, globular, 5.0 cm. in dia. From an early level of Sub-period IB (BPR-456).
4. Stone: ball, globular, 4.4 cm. in dia. From a mid-level of Sub-period IA (BPR-72).
5. Stone: ball, globular crude, 3.7 cm. in dia. spherical. From an early level of Sub-period IB (BPR-724).
6. Stone: ball, globular, 3.8 cm. in dia. From a mid-level of Sub-period IB (BPR-756).
7. Stone: ball, globular, 3.60 cm. in dia. From a late level of Sub-period IB (BPR-343).
8. Stone: ball, globular, 1.9 cm. in dia. From a late level of Sub-period IB (BPR-570).
9. Stone: ball, spherical, 3.8 cm. in diameter. From a late level of Sub-period IB (BPR-807).

Q. STONE QUERNS AND PESTLES

PL. XLII

Eight querns and seven pestles have been found. These were perhaps used for grinding grains.

1. Sand-stone: saddle quern, length 48 cm. width 23 cm., thickness 11.5 cm. From an early level of Sub-period IB (BPR-854).
2. Sand-stone: pastle plano-convex in section, length 16 cm., width 7.5 cms. From a mid-level of Sub-period IB (BPR-505).
3. Sand-stone: saddle quern, length 29 cm., width 12.5 cm., thickness 7 cm. From an early level of Sub-period IB (BPR-542).
4. Sand-stone: pestle, plano-convex in section, size: length 12 cm. width 5 cm. From a late level of Sub-period IB (BPR-42).

CHAPTER X

INSCRIBED MATERIAL

Jagat Pati Joshi

CHAPTER X

INSCRIBED MATERIAL

Inscribed material in the form of two tablets and nineteen sherds having graffiti has been found from Bhagwanpura. The graffiti marks are on late Harappan red ware, red ware associated with Painted Grey Ware and grey ware. The maximum graffiti marks are available on the late Harappan red ware which is ochrous. Generally, the graffiti is post-firing. The graffiti is engraved with a sharp instrument perhaps with a copper pin or a bone stylus. The point of piercing is always on the top side having a round hole and later it thins out. Some of the graffiti look like inscriptions and may represent a script e.g., 1,2,9,18,19 of the chart. The graffiti from Bhagawanpura assumes significance as these perhaps provide evidence of writing from the late Harappan and early Indian scripts represented by Brahmi and Kharoshthi. The illustrated specimens are described as below :

A. INCISED TABLETS

FIG.39; PL. XLIII A

A-1. Tablet: terracotta, concavo-convex, circular, dia. 5-6 cm. Convex side has prefired incised graffiti, concave side (back) has a deep cavity for holding the tablet or fixing a handle into it. The incision appears to have been made with a stylus vertically as top of the incised signs show a deep point of piercing and then the incised line thins out. In this case the stylus has been used six times for making the complete graffiti. The positive impression shows a Harappan hangover in the graffiti style. From a middle level of Sub-period IB (BPR-75).

PL. XLIII B

A-2. Tablet: fragmentary, terracotta concavo-convex dia. 4-9 cm. Convex side has an incised 'V' shaped graffiti. Back has a cavity for holding or fixing a handle into it. From an early level of Sub-period IB (BPR-75A).

B. INCISED POTSHERDS

FIG.40; PLS. XLIV-XLVI

B-1. **GRAFFITI** : post firing incisions on the rim portion of a basin in late Harappan red ware; a group of signs incised on the outer side. From a mid-level of Sub-period IB.

¹ B.B. Lal, "From Megalithic to the Harappan: Tracing back the Graffiti on Pottery", *Ancient India*, No. 16, p. 17; B.B. Lal, 'Some aspects of the Archaeological Evidence relating to Indus Script', *Puratattva*, no. 7, pp. 20-24; Jagat Pati Joshi and Asko Parpola, *Corpus of Indus Seals and Inscriptions*, 1. Collection in India, MASI, no. 86, Helsinki, 1987; B.B. Lal, *Op. cit.*, pp. 337-338. Also see I. Mahadevan, *The Indus Script* (New Delhi, 1977); S. Asthana, 'Graffiti on Pottery' A. Ghosh (ed). *An Encyclopaedia of Indian Archaeology* (New Delhi, 1989), p. 359.

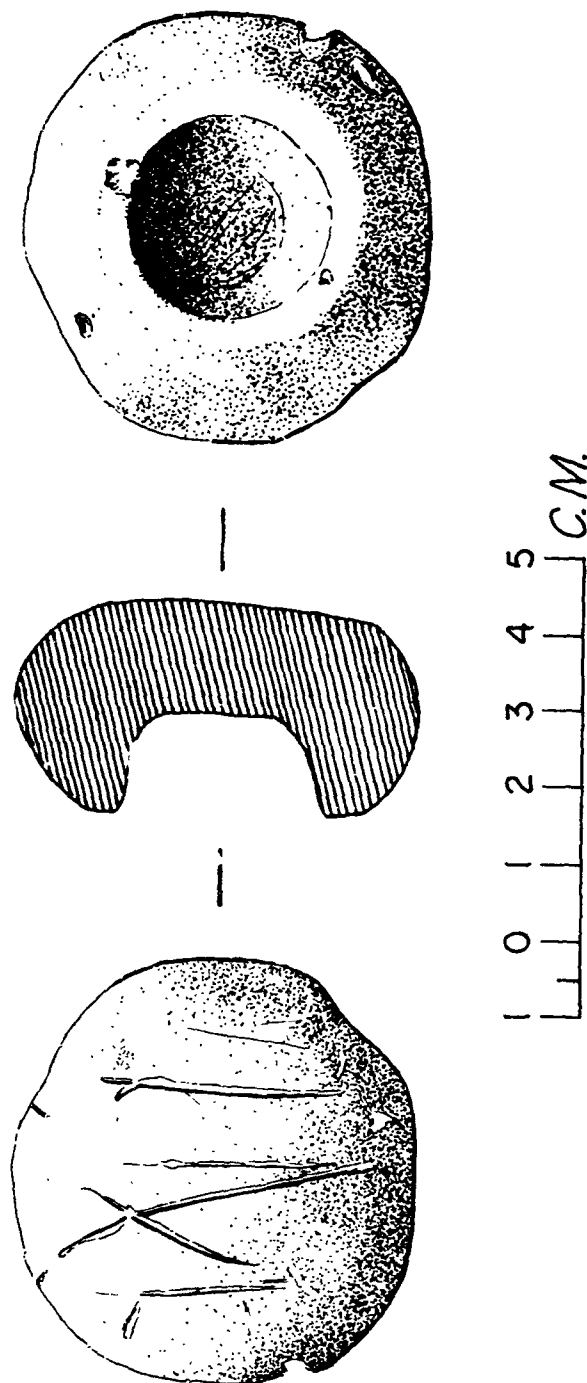


Fig. 39 : Inscribed terracotta tablet, Sub-period IB

- B-2. Graffiti : post firing incisions on the rim of a dish in late Harappan red ware; a group of signs incised on the inner side. From an early level of Sub-period IB.
- B-3. Graffiti : post firing incisions, fragment of a jar of late Harappan red ware; two slightly curved lines incised on the outer side. From a mid-level of Sub-period IB.
- B-4. Graffiti : post firing incisions, fragment of a dish of late Harappan red ware, a group of two signs, one with three vertical lines and other not very clear, incised on the outer side. From an early level of Sub-period IA.
- B-5. Graffiti : post firing incision, fragment of a basin of late Harappan red ware, sign akin to Harappan sign but with an elongated right line incised on the outer side. From a mid-level of Sub-period IB.
- B-6. Graffiti : post firing incisions, fragment of a dish of grey ware, sign having a twig with three branches, akin to Harappan sign. From a mid-level of Sub-period IB.
- B-7. Graffiti : post firing incisions, fragment of a dish of ochrous red ware, sign having a group of two vertical lines and a 'Y' shaped sign. From an early level of Sub-period IB.
- B-8. Graffiti : post firing incisions, pot sherd of ochrous red ware having a 'Y' shaped sign incised. From an early level of Sub-period IB.
- B-9. Graffiti : post firing incisions, pot sherd of ochrous red ware having a group of signs incised. From a late level of Sub-period IB.
- B-10. Graffiti : post firing incisions, pot sherd of ochrous red ware having three vertical incised lines with middle one smaller. From an early level of Sub-period IB.
- B-11. Graffiti : post firing incisions, pot sherd of late Harappan red ware having two lines, one longer and other shorter. From an early level of Sub-period IB.
- B-12. Graffiti : post firing incisions, pot sherd of late Harappan red ware. From an early level of Sub-period IB.
- B-13. Graffiti : post firing incisions on the fragment of a jar in red ware associated with PGW with two vertical lines incised. From a late level of Sub-period IB.
- B-14. Graffiti : post firing incisions, on the fragment of a jar in red ware associated with PGW, three vertical lines incised, the middle one is longer. From a late level of Sub-period IB.
- B-15. Graffiti : post firing incisions, pot sherd in late Harappan ochrous ware with a group of signs incised. From an early level of Sub-period IB.
- B-16. Graffiti : post firing incisions on the pot sherd in late Harappan red ware with a cross and a vertical line incised. From an early level of Sub-period IB.
- B-17. Graffiti : post firing incisions on pot sherd of late Harappan red ware with a twig like incised sign. From an early level of Sub-period IB.
- B-18. Graffiti : pre-firing on vase (broken) with a bulbous body in late Harappan red ware with a group of two signs incised on the shoulder. From an early level of Sub-period IB.
- B-19. Graffiti : pre-firing on a sherd of grey ware bowl having two intact symbols deeply incised (Sun symbol and a vertical eye sign). From a late level of Sub-period IB.

The following chart brings out the hang over element of Harappan signs in the graffiti found at Bhagwanpura:

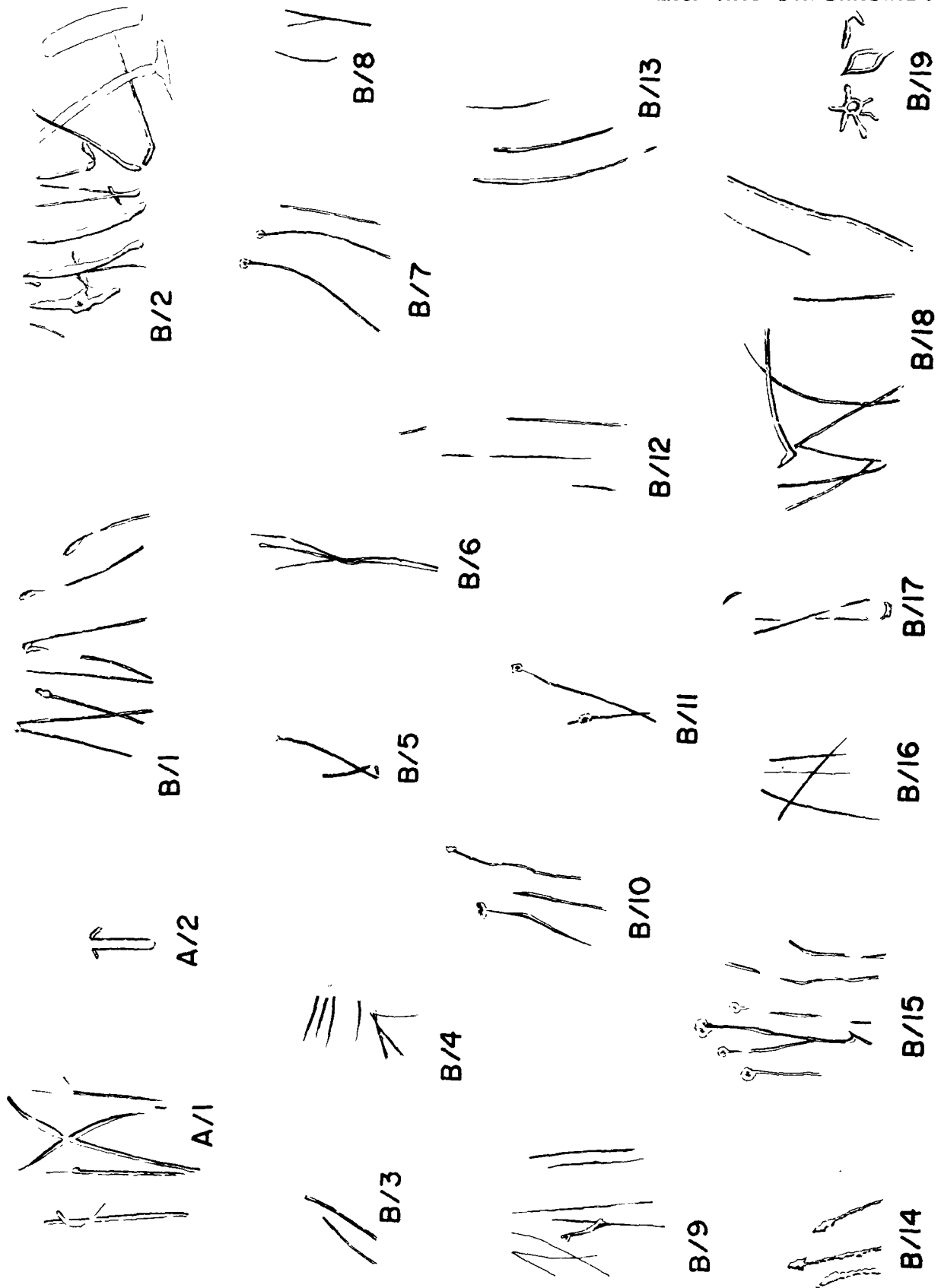


FIG. 40 : Chart showing graffiti

CHAPTER XI
ANIMAL SKELETAL REMAINS

A. K. Sharma

CHAPTER XI

ANIMAL SKELETAL REMAINS

Faunal remains from Bhagwanpura excavations belong to two periods of occupation :

Sub-period IA : Late Harappan culture *circa* 1700-1300 BC

Sub-period IB : Painted Grey Ware culture overlapping with late Harappan culture, *circa* 1400-1000 BC.

STATE OF PRESERVATION

Majority of the bones, recovered, are in good state of preservation due to formation of layers of silt over them from the flood deposits. Almost all of them have gained weight due to presence of high percentage of salt in the soil. The presence of encrustations have sealed the pores of the haversian canals thus preventing the entry of organisms and the enveloping matter. This has helped in keeping intact the characters of the bones. Due to presence of silt, most of the specimen are slightly reddish-brown in colour. Some have developed surface gloss. Collections from the lower levels emit metallicity of sound where as from the top levels have developed numerous cracks due to the arid atmosphere and presence of salinity.

NATURE OF THE COLLECTION

202 pieces of bones were subjected to examination for this report. As compared to Sub-period IA, almost double the numbers were recovered from Sub-period IB. This is particularly due to the fact that considerably less area of Sub-period IA was excavated due to the presence of structures etc. of Sub-period IB and does not indicate any comparative demographic position of various species in the two periods. In both the Sub-periods, the collection is overwhelmingly dominated by cattle bones. Only few of the bones, to be precise, one piece from Sub-period IA and six pieces from Sub-period IB are found in charred condition. Number of bones belonging to tender age animals are also few. Surprisingly there is not a single piece of bone having cut or butchering mark.

Few pieces of shafts of long bones, shaped ready to use as tools, have also been identified.

SPECIES IDENTIFIED

From the collection, ten species of animals could be identified. In both the Sub-periods cattle outnumber all other species followed by sheep and goat.

A. Sub-period IA has yielded the skeletal remains of the following species :—

1. *Bos indicus* Linn—the domestic cattle
2. *Bubalus bubalis* Linn—the Indian buffalo
3. *Capra hircus aegagrus*—the goat

4. *Ovis vignei* Blyth, race *domesticus*—the sheep
5. *Sus scrofa cristatus wagner* —the pig
6. *Canis familiaris* Linn—the dog.

Sub-period IB has yielded the skeletal remains of the following species :—

1. *Bos indicus* Linn—the domestic cattle
2. *Bubalus bubalis* Linn—the Indian buffalo
3. *Equus caballus* Linn—the horse
4. *Equus asinus* Linn—the ass
5. *Capra hircus aegagrus*—the goat
6. *Ovis vignei* Blyth—the sheep
7. *Sus scrofa cristatus wagner*—the pig
8. *Canis familiaris* Linn—the dog
9. *Axis axis* Erxleben—the spotted deer
10. *Lissemys punctata* (Bonnaterre)—River turtle.

Sub-period wise Percentage of Animals (fig. 41) is as under :

Species	Sub-period IA	Sub-period IB
Cattle	79%	67%
Horse	—	1.5%
Ass	—	3%
Sheep & Goat	12%	14%
Pig	1.5%	3%
Dog	3%	5.4%
T. Shell	—	5.4%
Spotted deer and others	4.5%	0.70%

1. *Cattle*: Both, *Bos, indicus* Linn (the Indian humped cattle) and *Bubalus bubalis* Linn (the Indian buffalo) are represented in both the Sub-periods. The population of both was almost even during the entire occupation of the site. There were distinctly two varieties of cattle at Bhagwanpura, one of the massive size and the other dwarf size. The cattle population of 79% in Sub-period IA and 67% in Sub-period IB, far out-numbered the population of all other species represented in the site indicating that animal husbandary was one of the major source of economy along with agriculture for the inhabitants of Bhagwanpura. The trend from Sub-period IA to Sub-period IB shows a receding pattern which was coupled with slight increase in rearing of sheep and goat from Sub-period IA to Sub-period IB. This is probably indicative of the fact that the Painted Grey Ware people who arrived at the site around *circa* 1400 B.C. made their own contribution in the existing economic pattern of the society which was earlier more dependent on animal husbandry. This was quite natural as the Painted Grey Ware people led a sort

INCIDENCE OF ANIMALS AT BHAGWANPURA, 1975-76 Distt. KURUKHESHTRA

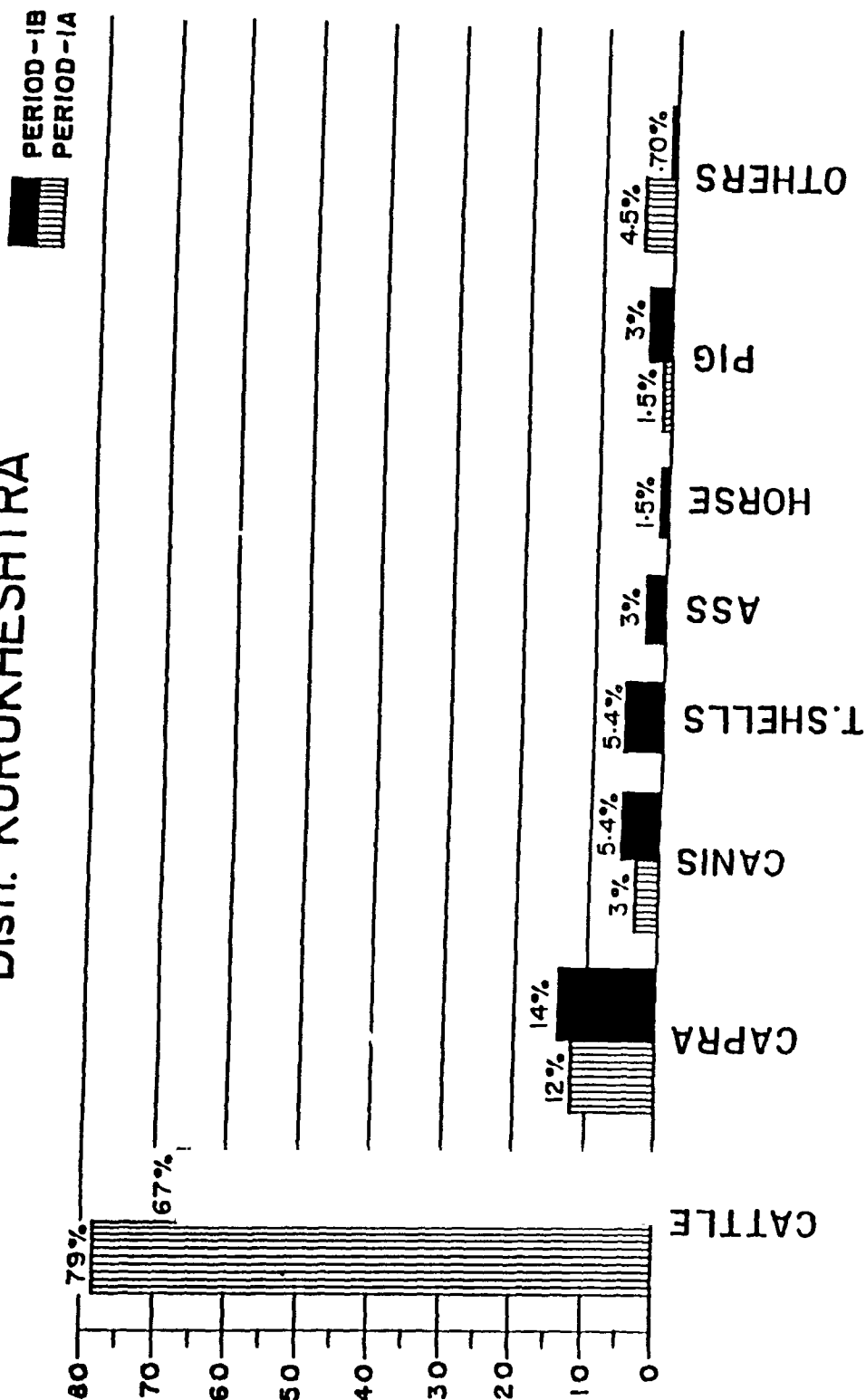


FIG. 41 : Chart showing incidence of animals

of nomadic life with rearing of sheep and goat being one of their main occupations. A few horncores obtained from both the Sub-periods point upwards and not sideways as in the wild proto type.

Total absence of cut marks indicate that cattle were mainly reared for milk and draft purposes. A close examination of third phalanx of large number of cattles show the increase of pedosis and exostosis pointing to the increasing dependence of men on cattle, in both the Sub-periods, for draft purposes. The people were practising a lot of agriculture that require extensive use of cattle, both for ploughing and drawing of vehicles (fig.41).

As the specimen belonging to that of buffaloes do not exhibit any evidence of ankylosis, pedosis and exostosis, it is clear that buffalo population was not used for traction and agricultural purposes. The animal was reared solely for milk.

Cattle belonging to massive variety have also been identified from other Harappan sites like Kalibangan, Malwan, Lothal and Surkotada¹. The type available at Bhagwanpura hardly differs in any way from those identified at the above mentioned sites (pls. XLVII; XLVIII A and B, 4-6; XLIX; L; and P).

2. *Sheep and Goat* : After cattle sheep and goat bones form the second largest chunk of the collection. There is a slight increase in the population of sheep and goat from Sub-period IA to Sub-period IB. These animals are represented in the collection mostly by mandibular and maxillary fragments, metacarpal, metatarsal and limb bones.

As only some superficially charred bones of these animal have been recovered and as there are hardly any specimen bearing cut marks, it can probably be surmised that sheep and goat were mostly reared for wool. Few younger ones were roasted without being dismembered probably on special ceremonial occasions for food. They were rarely slaughtered as was also the case with cattle.

The size of the bones indicate that both reared sheep and goat were of medium size. Well-preserved teeth with sharp cutting edges indicate that there was plenty of green fodder available around.

3. *Pig* : The pig remains have been identified from most of the sites in India. Actually wild boar, the ancestor of modern day pig were associated with man in India right from the Neolithic times (*circa* 3000 B.C.) as per evidence from Burzahom and Gufkral. In Harappan context, this animal has been reported from Harappa, Mohenjo-daro, Ropar, Lothal, Rangpur, Surkotada and several other later sites. Indian domesticated pig is the domesticated form of the wild *sus scrofa* Linn. The population of pig increased to 3% in Sub-period IB from 1.5% in Sub-period IA. In fact in the collection under study there is only a solitary bone of pig from Sub-period IA. The considerably lesser percentage of this animal at the site as compared to cattle show that pork was not much preferred. Recovery of a superficially charred piece from Sub-period IB and absence of any marks indicate that pig was roasted before dismemberment as is the practice even today amongst some strata of the society.

4. *Dog* : Indian wolf *Canis lupus* is probably the ancestor of the domesticated variety of dog in India as per evidence available at Burzahom and Gufkral (both are neolithic sites in Kashmir valley).

¹ A.K. Sharma, 'Animal Bone remains' in Jagat Pati Joshi, *Excavations at Surkotada and Exploration in Kutch*, (New Delhi, 1990), p. 377.

ANIMAL SKELETAL REMAINS

Two distinct types of dogs, domesticated in India are: i) a type akin to Pariah and ii) a mastiff type. The type recovered from Bhagwanpura resembles the Pariah. Remains of this variety have also been reported from Ropar, Lothal, Kalibangan, Rangpur, Surkotada etc.

Their number shows nearly double fold increase from Sub-period IA to Sub-period IB. This is probably due to arrival of Painted Grey Ware people at the site in Sub-period IB, who were basically pastoralists and kept herds of sheep and goat and to whom dog was of great help in controlling and guarding the herds.

The bones of dog are fragile and disintegrate earlier as compared to the bones of cattle. As such this is another reason for their lesser percentage in most of the sites from where animal bones have been studied.

5. *Horse and Ass*: *Equus* bones have been recovered only from Sub-period IB. The number of ass bones are just double that of the horse. The parts recovered are very distinctive bones, i.e. metatarsal, first, second and third phalanges and teeth. The bones recovered belong to medium sized variety. The animals were mainly used for transportation of men and material (pl. LI A).

The occurrence of few bones of *Equus* in archaeological sites is probably due to the reason *Equus* population to that of cattle, sheep and goat was much less. In India, even today also, in a village hardly one or two horses could be found and some have even none².

HUNTING

Very limited number of bones belonging to wild game animals recovered from the site show that there were not many game animals in the vicinity. Due to plenty of agricultural products and animal husbandry, Bhagwanpura people were not much interested in hunting. Recovery of a horn core of a spotted deer or black buck shows that hunting was only a pleasure game for some.

FOOD HABITS

- A. Bhagwanpura people were mostly dependent on agricultural products for their food.
- B. They reared large number of cattle including buffaloes for milk.
- C. In Sub-period IB, by some section of the society, roasted pig meat was eaten on special occasions. Some of the bones show symptoms of being submitted to fire. A few approach the stage of charring. Light burning may indicate that roasting was done using mostly dry grass and leaves and not solid fuel.
- D. Absence of fish bones indicate that probably there was no deep water source in the vicinity or people did not like fish. Recovery of good number of shells (some charred) belonging to freshwater turtle indicate that the turtles were brought from some distance for food. Shells were used for making decorative designs as well as flesh rubbers.

² Also see A.K. Sharma, *Op. cit.*, p. 381; Bholanath, 'Animal Remains' in B.B. Lal, *Excavations at Hastinapura and other explorations in the Upper Ganga and Sutlej Basins* 1950-51, *Ancient India*, no. 10 & 11, p.167.

BONE TOOLS (PL. LI B)

Recovery of crudely made field bone tools from Bhagwanpura seem to be associated with the system of roasting of flesh for food because even after roasting, the flesh was to be separated from the bone. Most common tools recovered are points, scrapers and piercer-cum-scrapers. Mostly splinters of long bones of large animals were used by giving secondary retouch and by grinding to create sharp edges. Point-cum-knives were used to pierce through the mass of thick flesh and cut out small pieces for easy consumption. The tools which are used to dislodge roasted flesh usually become black from soot and on their surface sets a shine typical of contained marrow or fat. These symptoms are available in the collection under study.

Scrapers with sharp edge were used mostly for removal of fat.

These tools were actually on the spot made ready to use tools for immediate need.

DISCUSSION

Faunal remains recovered and studied from the two Sub-period at Bhagwanpura indicate about the agricultural activities, economic role of animals at the site and food habits of the people of Bhagwanpura. They also throw some light on the ecological condition in the area.

- (1) Cattle far outnumbered all other species. They were used for agricultural and draft purposes. Animal husbandry was widely practised. In Sub-period IB horse and ass were also used for transportation of men and material. But only few had the privilege of possessing horse and ass.
- (2) Sheep and goat was reared mostly for wool. Cattle and capra wealth was possessed by almost every family.
- (3) People of Bhagwanpura in both the Sub-period did not relish meat and pork much. They were predominantly vegetarian. This is also supported by the fact that the teeth of the two human skeletons, recovered from the site, do not show much wear and tear. The people enjoyed plenty of milk food. Occasionally some people used to go for hunting as a game and not due to compulsions of food. Moreover not much game was available in the near vicinity.
- (4) Wool was in plenty to protect the people from cold of the area.
- (5) All the bones of the domesticated variety of animals are well developed and robust showing no signs of rarification. This indicates that there was plenty of fodder available in the area.
- (6) Due to favourable climatic conditions, agriculture was well developed.
- (7) Due to fertile nature of soil and plenty of water the ecological condition was a balanced one.

CHAPTER XII

FIELD OBSERVATIONS ON HUMAN SKELETONS

A. K. Sharma

CHAPTER XII

FIELD OBSERVATIONS ON HUMAN SKELETONS

Two human skeletons have been unearthed at Bhagwanpura in the habitation area from the Painted Grey Ware—Late Harappan overlap Cultural levels. Both the skeletons are lying in north-south orientation with skull towards north and face tilted towards west. Both are lying in the same line and almost at the same depth from the top. One skeleton belongs to an adult of advanced age and the other to that of a child of nearly 8-10 years of age. From external appearance, the skeletal remains of both appear to be considerably old. Many portions particularly the epiphyses have totally disintegrated. Remaining bones are very fragile. Both the burials are devoid of any grave goods (fig.42).

SKELETON NO. 1 (CHILD), BURIAL NO. 1 (PL. LII A)

A skeleton of a human child is found in trench No. B1, Qd. 1 at the depth of 65 cm. B.S. lying in almost prone position in the deposits of Flood 2. The Flood 2 deposit is sealed by layer no. 5 as indicated by the section looking south. No grave pit for this skeleton is detected. The deposits in which the skeleton is lying embedded, is composed of fine sand, kankar, fragments of Painted Grey Ware and Red Ware.

The skeleton belongs to a child of nearly 8-10 years of age. Skull portion is damaged to some extent. The skeleton is lying in north-south orientation with skull towards north and legs towards south. The skeleton is slightly tilted towards right, torso resting in the right side and skull completed lying side ways with face looking west. It is resting on the right side. Right hand is lying straight whereas left hand is resting over the chest. Legs are slightly bent near the knees. Extremities of almost all the long bones are missing. Foot bones and left hand bones are totally missing. Pelvic girdle is in very much damaged condition.

Maximum length of the skeleton in-situ condition is 1.04 m, maximum width at the pelvic region is 19 cms.

Skull: The skull bones have cracked into several pieces. Length of the skull is more as compared to the width. Frontal and occipital bones are intact. Foramen magnum, mastoid process, both the eye orbits, nasal bones and zygomatic arch are intact. Few parts of maxilla temporal bones are missing. On the upper jaw two molars, a premolar and two incisors are visible. The lower jaw is intact and is lying in articulated condition. On the lower jaw two molars, 2 premolars and 3 incisors are visible.

Vertebral column: The vertebral column is lying in articulated condition but in a very damaged and fragile condition. Fragments of bones right from atlas vertebra to lumbar vertebra are present. Spines of all have broken. Almost all the vertebrae are in different stages of ossification.

Pectoral girdle: Left scapula is almost intact but the collar bones are broken. Only a portion of right scapula is visible. 12 ribs are visible in the left side whereas on the right only 5 are seen.

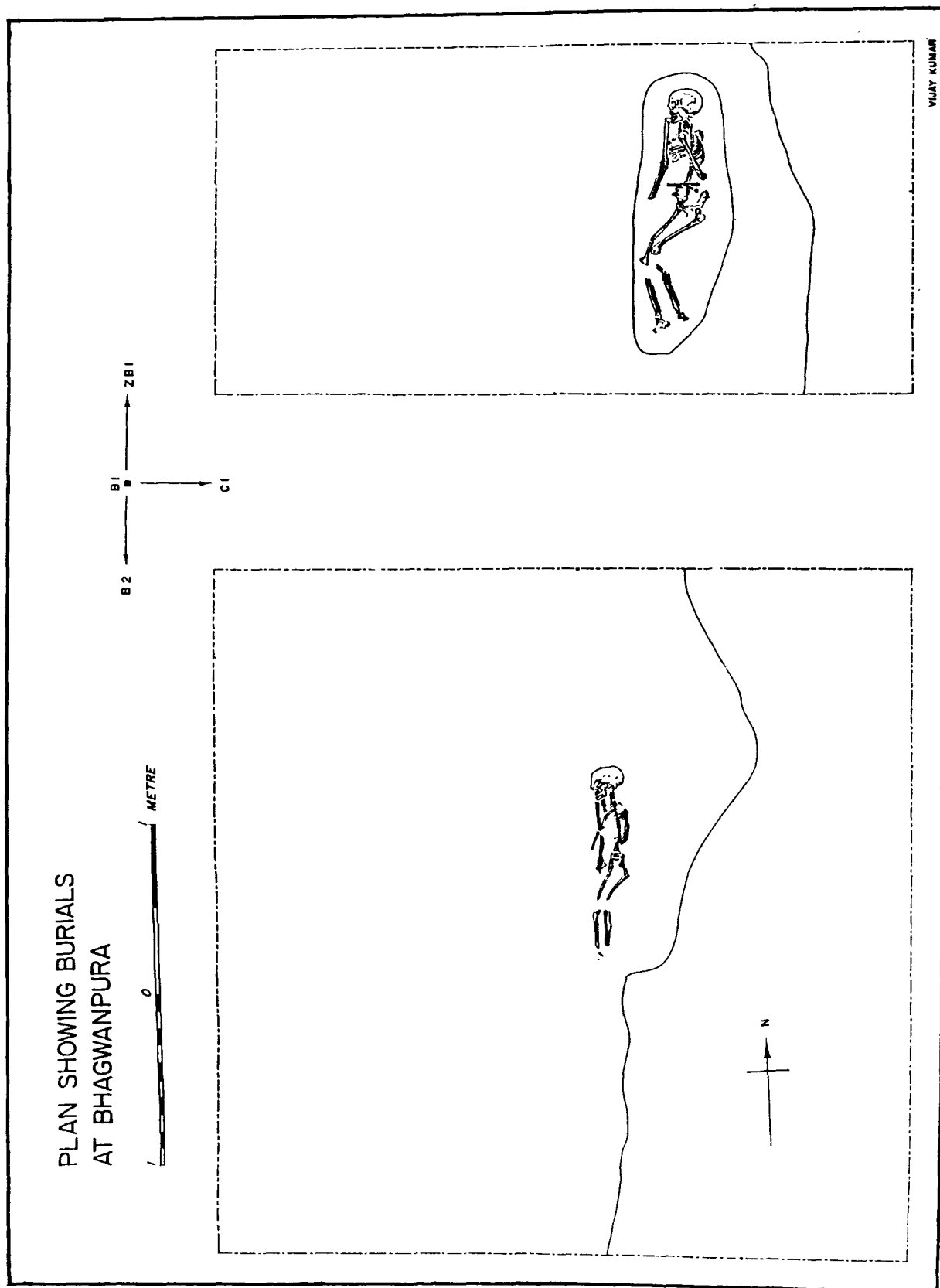


FIG. 42 : Plan showing burials etc.

FIELD OBSERVATIONS ON HUMAN SKELETONS

Hands: Left humerus is lying buried below the pectoral girdle with only a portion of head visible and that too in damaged condition. Left ulna is present in intact condition but is disarticulated. Right hand bones are lying in perfect articulated condition. Ossification at the proximal end of humerus is not complete. Lower one third of humerus is damaged. Proximal epiphyses of right radius and ulna have disintegrated where as distal ends are slightly damaged. Shafts are intact. Almost all the carpal and metacarpal bones are present in articulated condition.

Pelvic girdle: The pelvic bones are lying in articulated condition but considerably disintegrated. Iliac bones have broken. Ischial and pelvic bones are partly present. Various portions show a very slight degree of ossification.

Leg bones: Both the femur are lying in articulated condition with their head region embedded in their respective notches. Heads have not ossified. Distal end of both the femur are totally missing. Both the patella are missing.

Left tibia is found in two pieces with the distal epiphysis missing. Right fibula is found in 4 pieces. Distal ends of right tibia and fibula are missing. Except one phalange all the tarsal and metatarsal bones are missing.

Length of right humerus	18 cm
Length of right radius	13 cm
Length of right ulna	13 cm
Length of left ulna	16 cm
Length of right femur	23 cm
Length of left femur	24 cm
Length of left tibia	21 cm
Length of left fibula	21 cm
Length of right tibia	22 cm
Length of right fibula	20 cm
Length of right hand bones	11 cm

SKELETON NO. 2 (ADULT), BURIAL NO. 2 (PL. LII B)

A human grave is found in trench No. ZB 1, Qd. 4 at the depth of 75 cm. The grave pit is 1.68 m long and 0.57 m wide. It is cut through the deposits of Flood 2. The filling in the grave pit consists of sandy sticky clay mixed with kankar and tiny fragments of pot sherds. The sealing layer of the grave pit could not be established as the grave was detected after the skeleton level was reached. In the process of digging the skull and knee portions got considerably damaged.

The grave yielded an adult human skeleton lying in prone position with legs slightly bent at the knee region. The skeleton belongs to that of a male. It is resting slightly tilted on its right side with the skull also resting in its right and looking towards west. Right hand is in straight position where as left hand has been bent at the ankle joint.

The bones appear to be of considerable age and are in very fragile condition. Almost all the parts have developed numerous cracks. Barring few tarsal bones of right leg, all the tarsal and metatarsal bones are missing.

Skull : The skull has been very badly damaged. A portion of frontal bone and major parts of left parietal are missing. Both the eye orbits are present. Nasal bone is intact. Left zygomatic arch is missing. Maxilla is in very fragile state of preservation and contains 2 molars, 2 premolars. Mandible is in articulated condition but left half of mandible is badly damaged particularly the angle region. Two left molars and 2 premolars are present. Teeth are considerably worn out, particularly of the lower jaw.

Vertebral column : Vertebral column is in articulated condition with sacral vertebrae missing. Other vertebrae are in a very fragile state with spines of all broken.

Pectoral girdle : Left scapula is damaged and only a position of right scapula is visible. Both the collar bones are present but disturbed from their position. Seven left ribs are present in fragments. Similarly seven ribs are visible on the right side.

Hands : Left humerus is lying dislodged from its articulated condition. It is lying almost across the chest region with the head of the humerus towards the head of the right humerus.

Though the entire left humerus is present it has broken into three pieces. Middle shaft is crushed beyond recovery. Distal and proximal ends are intact.

Right humerus is lying in articulation. Its head region is embedded in the acetabular cavity. A crack has developed in the neck region. Distal end is intact.

Right radius and ulna are intact and are lying in articulated position. Left radius and ulna are present only partially and that too in disarticulated condition. Distal and proximal epiphyses of radius are broken. Only the proximal half of left ulna is present with the angle intact.

Carpels and metacarpels are totally missing.

Pelvic girdle: Pelvis is present in broken but articulated condition. Right half is more damaged than its left counterpart. Left iliac bone is broken on its ridges. Right iliac bone is present only in fragments. Ischium is intact but pelvic bone is partially present. Both the glenoid cavities are present.

Leg bones: Both the femur are lying in slightly bent condition, in articulation. Left femur at its distal end had cracked into several pieces. Lower epiphysis has disintegrated. Head of femur is lodged in the glenoid cavity. It has cracked across the neck region. The entire right femur bone has broken into several pieces. Distal end is almost missing.

Both the patella are missing. Both the tibia are in extremely damaged condition. Lower and upper extremities are missing. Similar is the case with both the fibulae. Only one or two pieces of tarsal bones are present in damaged condition. Metatarsals are totally missing.

Ossification in the long bones is complete.

FIELD OBSERVATIONS ON HUMAN SKELETONS

Maximum length of skeleton	1.44 m
Maximum width of skeleton at the ribs	25 cm
Maximum length of left humerus	29 cm
Maximum length of right humerus	29 cm
Maximum length of right radius	21 cm
Maximum length of right ulna	21 cm
Maximum length of left radius	20.05 cm
Maximum length of left ulna	12.00 cm
Maximum width of pelvis	2.00 cm
Maximum length of left femur	38 cm
Maximum length of left tibia	34 cm
Maximum length of left fibula	30 cm
Maximum length of right femur	38 cm
Maximum length of right tibia	28 cm
Maximum length of right fibula	27 cm

CHAPTER XIII

**A MORPHOMETRIC ANALYSIS OF THE HUMAN
SKELETAL REMAINS**

S. C. Tewari and Sarla Banerjee

CHAPTER XIII

A MORPHOMETRIC ANALYSIS OF THE HUMAN SKELETAL REMAINS

Two human skeletons, one of an adult of advanced age and the other that of a child, nearly 8 to 10 years of age, were excavated from Bhagwanpura. These two skeletons belong to the habitation area of Sub-period IB levels. Both these skeletons were found lying in the same line and depth with north-south orientation. The skulls of both the skeletons were oriented towards north and their faces tilted towards west. No grave goods were found along with the burials. The bones were fairly well preserved except at the epiphysial ends which were totally disintegrated.

The skeletons, when delivered to this laboratory, were packed in wooden boxes. The matrix adhering to both the skeletal remains were sandy in colour and medium to fine grained in texture. It was easily cleaned off from the bone except at places where preservative had penetrated the matrix and had hardened it. Since the matrix adhering to these specimens was indurated and quite difficult to separate from the bone, making preparation and cleaning of the specimens was quite difficult and time consuming.¹

The preservation of skeletal elements attributable to burial 1 & 2 was moderately good to poor. Both the Cranial and post-Cranial comprise the bulk of the osseous remains of burial 1 & 2. Preservation of the upper extremities was much better than that of the lower limbs. Certain minor post-mortem deformation had occurred at the epiphysis of a few bones. The epiphysis have suffered extensive post-mortem damage and were completely missing in most instances. A tabulation of the skeletal elements present in the burial, including specific comments for each bone regarding state of preservation, morphology and pathology is described below.

SKELETON No. 1, BURIAL No. 1

The skeleton was lying in north-south orientation with skull facing towards north and legs towards south. The skeleton facing west was slightly tilted towards right, torso resting in the right side and completely lying sideways. Right hand was lying straight whereas left hand was resting over the chest. Legs were slightly bent near the knees.

Epiphysis of almost all the long bones were missing. Foot bones and left hand were totally missing. Pelvic girdle was in very damaged condition.

Skull:: The skull was very well preserved except that some cracks had appeared post-mortemly (pl. LIII A). The frontal bone was complete with the exception of a horizontal hair-line crack originating from the left side (*norma lateralis*) running through the right side and a vertical crack on the right side, extending upto coronal suture. The coronal suture was well fused at the temporal region but at the sagittal region it showed wide gaps of post-mortem origin. The two parietal bones had fused together

¹ S.C. Tiwari and S. Banerjee, 'Human Skeletal Remains From Bhagwanpura' (Unpublished Paper).

to form 'Serrated sagittal suture'. Posteriorly, the skull was somewhat damaged at the region where the sagittal suture meets the lambdoid suture (pl. LIII B).

The eye-sockets were very well preserved. All the bones which constitute the orbit were in very good state of preservation including the ethmoid bone, the greater wing of the sphenoid bone, the lesser wing of the sphenoid bone, the superior orbital fissure and the inferior orbital fissure. The supra orbital ridges, though not very prominent, were well preserved and quite perceptible.

The pyriform aperture of the nasal cavities was pear shaped, i.e., wider below than above and was in a good condition. The two nasal bones articulate with each other in the median plane.

The maxillary bones were in a good state of preservation. It was the growth of these bones which was responsible for the elongation of face that occurs between the ages of 6 to 12 years. The anterior surface of the maxilla was visible in the norma frontalis orientation. A prominent, sharp projection marks the meeting of the two maxillae in the lower boundary of the aperture as was termed as 'anterior nasal spine' but in this case only the base of the nasal spine was present.

In the norma lateralis, the zygomatic processes of the temporal bone were damaged post-mortemly. Behind the auditory meatus, the norma lateralis was formed by the well preserved mastoid region of the temporal bones. The mastoid processes were nipple shaped and in good state of preservation. The position of the asterion was slightly displaced post-mortemly. The styloid processes were broken (pl. LIV A).

In the norma occipitalis position, the external occipital protuberance was smooth in the median plane. The curved ridge termed as nuchal lines were present and pass laterally from the protuberance.

The lower portion of the skull was bound in front by the incisor teeth of the maxilla, behind by the superior nuchal lines of the occipital bone and laterally by the zygomatic arches and its posterior root and the mastoid processes. All the above mentioned bones were in very good state of preservation. The anterior part was formed by a hard palate and the alveolar arches (pl. LIV B).

The morphometric measurements, angles and indices are listed in Table-1.

Mandible: The mandible was somewhat damaged but with careful reconstruction it was possible to take morphometric measurements. The left coronoid was partly damaged. Both the ramii were intact. The mandible was vertically straight at symphyseal region. Condylar processes were small rounded and feeble with small and broad coronoid processes. The gonial angle was not sharp (pl. LV A). The mental foramen was quite conspicuous. The mental protuberance and mental tubercle was ill marked. The gonial fossa and tubercle were not traceable. Sublingual fossa was very weak and not perceptible. The mandible was cracked from the base of right canine running obliquely towards the lateral side. The right canine was missing (pl. LV B).

The morphometric measurements are shown in Table-2.

Vertebral column: The vertebral column was found in articulated state. It was damaged extensively and had become very fragile. All the vertebrae were in different stages of ossification. The spines of most of the vertebrae were damaged.

The Atlas vertebra was missing but the rest of the cervical vertebrae were found intact. Out of these six cervical vertebrae, three were in a very good state of preservation and the rest were found in fairly damaged condition.

The second cervical vertebra (axis) was distinguished from others by means of the strong tooth like odontoid process, which projects upward from the body and was very well preserved. The process bears on its anterior surface a small facet for articulation with the facet on the posterior surface of the anterior arch of the Atlas. On each side a large oval facet was present on the upper surface of the body. The inferior articular processes were well defined and face downward and forward as in the typical cervical vertebrae. The foramen transversarium was present on one of the sides only, whereas on the other it was damaged. The transverse processes of either side were also damaged. The laminae were developed with a heart shaped vertebral foramen. The spinous processes were broken.

Foramen transversarium was damaged in all the cervical vertebrae except in fifth. The spine was bifurcated in all these vertebrae except in vertebrae prominence (Seventh cervical vertebra). Spinous process of the seventh cervical was thick and nearly horizontal ending in a tubercle. The transverse processes and transverse foramen were damaged in this vertebra.

All the thoracic vertebrae were damaged beyond reconstruction. Only three lumbar vertebrae were well preserved. The vertebrae could be easily differentiated from other vertebrae by their great size and by the absence of costal facets on the side of the body. The body was large, wider from side to side than from backwards, and a little deeper in front than behind. The vertebral foramen was triangular in shape. The free end of the spinous processes was damaged and thickened along its posterior and inferior borders. The superior articular process bear gently concave articular facets which face medially and backwards. The posterior border of each process were marked by a rough elevation termed as the mamillary process. The inferior articular surface was well preserved only in one of the lumbar vertebrae. In the other two lumbar vertebrae, only the inferior articular surfaces were present on one side only. The inferior articular surfaces were badly damaged on the other side. The transverse processes were damaged in all the lumbar vertebrae. A small rough elevation, the accessory process, marking the posterior-inferior aspect of the root of each transverse process was present.

The sacrum is missing. The coccyx was triangular in shape consisting of three rudimentary vertebrae fused together. These vertebrae were held together because of the matrix. The first coccygeal or caudal vertebra shows rudimentary transverse process projecting laterally from each side of the body. The second vertebra revealed traces of transverse process. The third coccygeal vertebra was a mere nodule of a bone (pl. LVI A).

Limb Bones Humerus (Right): The upper half of the bone was well preserved and intact but lower half of the shaft along with the epiphysis was completely missing. The head was well preserved but there was no definite demarcation between lesser and greater tubercle (pl. LVI B). Here the tubercles joined to form a single large epiphysis which was hollowed out on its inferior surface. The bicipital groove was feebly developed owing to its young age. Deltoid tuberosity was present but it was in initial stages of development. The left humerus was missing.

The morphometric measurements on the humerus are given in Table-4.

Radius (Right): The shaft of the radius was very well preserved but the proximal and the distal ends were damaged. The head, neck and the tuberosity was present on the upper end of the radius. The neck of the radius was constricted below the head and was over-hung by it, specially on the lateral side. The tuberosity of the radius was placed below the medial part of the neck and was very prominent.

The shaft of the radius was gently curved with convexity directed towards the lateral side. The interosseous border was well preserved and developed except at its upper end, where it approaches the lower part of the tuberosity. On the lower end, the styloid process was damaged but the lateral surface was slightly rough and projected downwards (pl. LVII A)

Radius (Left): The shaft of the bone was well preserved. The upper end of the radius was missing including the head and the neck. The lateral surface was slightly rough and projected. The styloid process was damaged.

The osteometric measurements on the right radius are given in Table-5.

Ulna (Right): The right Ulna was missing.

Ulna (Left): The ulna bone was very well preserved. The upper end was thick, strong and hood-like, the concavity of the hook being directed forwards. The lateral border of the shaft was thick bearing a sharp crest. The bone diminished in size from its upper to its lower end which bears a small rounded enlargement termed the head of the ulna. The bone shows slight but appreciable double curve. The lower end of the ulna was slightly expanded with rounded head and a damaged styloid process. The surfaces of the ulna (anterior, posterior and medial) and the borders (anterior, posterior and interosseous) were easily identifiable (pl. LVII B).

The osteometric measurements and a few indices on the left ulna are listed in Table-6.

Femur (Right): The head of the femur and the greater trochanter were damaged. The lesser trochanter was present anteriorly but totally damaged posteriorly. The inter-trochanteric line was not visible because the neck was damaged at the posterior side. The neck was present anteriorly. The lateral and medial borders were all well defined. The Linea Aspera was broad and rough. Well marked and fairly well preserved popliteal surface was present.

Femur (Left): The shaft of the femur was well preserved though broken. The lower epiphysis was damaged. The upper end of the bone was also damaged to some extent. The head, too, was damaged but the neck was preserved. The anterior surface of the neck was flattened and there was no inter-trochanteric line. At the posterior surface, the junction of the neck with the shaft was marked by a feebly developed ridge termed as inter-trochanteric crest. The greater trochanter was present at the anterior side but it was somewhat damaged posteriorly. The lesser trochanter was well preserved and was small in size. The femoral shaft was well preserved except the proximal part which was completely missing.

The anterior surface was smooth and gently convex. The lateral and medial borders were rounded and ill defined. The posterior border was formed by a broad rough ridge termed as Linea Aspera which was well preserved. At the posterior surface of the lower third, a well preserved popliteal surface is noticeable (pl. LVIII A).

The measurements on the right and left femur bone are listed in Table-7.

Tibia (Right): The upper end of the tibial bone was expanded, specially in the transverse axis, to provide a good bearing surface of the body weight transmitted through the lower end of the femur. The medial and the lateral condyles were damaged at the articular surface. The tuberosity of the tibia was placed at the upper end of the anterior border of the shaft and well preserved.

The shaft was in good condition except at the proximal end where it was damaged. All the borders (medial and interosseous) were well marked except for the anterior border. The lower end of the tibia was damaged. The soleal line had not yet become conspicuous. The area below this line was sub-divided by a faint vertical line which starts at or just below the middle of the soleal line and fades away (pl. LVIII B).

The measurements on the right and left tibia are given in Table-8.

Tibia (Left): The articular surface of the tibia was damaged along with the lateral and medial epicondyles, but the tuberosity of the tibia was well preserved. More than half of the soleal line was damaged. The proximal end of the tibia was broken.

Fibula (Right and Left): Only the shaft of the bone was present in both right and left fibulae. The shaft was reconstructed after careful cleaning. The head and the medial malleolus were damaged in both the right and left bones.

On the shaft of fibula, all the borders (anterior, posterior and interosseous) were identifiable and well preserved. The lateral surface, medial surface and posterior surface were also in good state of preservation (pl. LIX A).

The osteometric measurements on the fibula are given in Table-9.

Observations on Dentition: Morphometric variation in human dentition plays an important role in understanding of evolutionary trends in *Homo sapiens*. However, anthropological study of dentition of prehistoric and proto-historic Indian population remains a neglected field. Hence a need to build data for human dental variation is of immense importance². The present study on the dentition of Bhagwanpura remains was carried out to find the mean values for mesiodistal and buccolingual diameter of deciduous teeth and permanent teeth of the two human skeletal remains.

The teeth were measured for mesiodistal crown diameter (M.D.) and buccolingual crown diameter (B.L.) according to the method described by Moorrees³. From M.D. and B.L. diameters, Crown Index

² J.R. Lucas, 'Crown Dimensions of Deciduous Teeth from Prehistoric India', *Am. J. Phys. Anthropol.*, 55. (1981), pp. 261-266.

³ C.F.A. Moorrees, *The Alveolar Dentition*, Cambridge, Harvard University Press.

(C.I. = $B.L./M.D. \times 100$), Robustness Value ($R.V. = B.L. \times M.D.$) and Crown Module ($C.M. = B.L. + M.D./2$) were calculated according to the method described by Goose⁴.

A careful observation of Skeleton no. 1 from Burial I showed that the teeth were in fairly good condition without any sign of dental attrition. The permanent dentition seems to have appeared, but first molar of deciduous dentition was not replaced by second Premolar of permanent dentition, though its presence could be observed within the sockets of the alveolar region. The first molar of permanent dentition exhibited the highest mesiodistal and buccolingual diameter followed by molar of deciduous dentition (Table-10). The permanent molars also showed highest module index and robustness index followed by deciduous molars.

SKELETON No. 2, BURIAL No. II

The osseous remains from Burial No. 2 were in a fairly bad condition of preservation as compared to Burial No.1, Consequently it was not possible to take many Craniometric and Osteometric measurements.

Skull: The skull from Burial No. II was in a bad state of preservation. It was small in size and showed lots of cracks. The left side of the skull was badly damaged and most of the bones were missing like left parietal, squama of temporal, zygomatic arch, etc. (pl. LIX B).

Posteriorly, however, the skull indicated least damage. The lambdoid sutures were intact though most of the other sutures suffered from post-mortem gaps. Further downwards, the right eye socket was well preserved but the left one was extensively damaged. The foramen magnum was well preserved. The interior part of the fossae was formed by the basilar part of the occipital bone, which is fused in front with the posterior portion of the sphenoid bone. The fused part of the bone was well preserved. The mastoid processes were also well preserved. The nasal cavity does not show any post-mortem destruction. The maxilla shows marks of muscular attachment and was well preserved except at its medial part which forms the lower margin of the orbit where it shows cracks and also somewhat damaged. The anterior nasal spine had suffered post-mortem destruction although the bone was still visible (pl. LX A).

The zygomatic arch of the right side had to be reconstructed but the left arch was completely missing. The supra orbital ridges were prominent and well preserved. The supraorbital occipitalis shows the presence of external occipital protuberance as also the ridge for the attachment of nuchal muscles. The mastoid processes and the mastoid part of the temporal bone could be seen in the inferior lateral part of the norma occipitalis. The styloid processes were missing.

The morphometric measurements, angles and indices are listed in Table-11.

Mandible: The mandible was in a better state of preservation as compared to skull from Burial No. II. It was possible to take quite a few morphometric measurements on the mandible. Both right and left

⁴ D.H. Goose, in D.R. Brothwell (ed). *Dental measurements*, Pergamon Press (London 1963).

ramus was intact. Condylar processes were large and rounded with fairly broad coronoid process. The gonial angles were not sharp. The mental protuberance and the mental tubercle was well marked and conspicuous. Broadly speaking the lower jaw was large and powerful.

The morphometric measurements are given in Table-12.

Vertebral Column: The vertebral column was extensively damaged. After careful cleaning and reconstruction, only eleven vertebrae could be used for metrical analysis. Out of these eleven vertebrae, three were cervical, six thoracic and two lumbar. These eleven vertebrae were in good state of preservation and presented the usual anatomical features.

The morphometric measurements are listed in Table-13.

Limb Bones Humerus (Right and Left): Both the right and left humerus were very well preserved. The shaft of both right and left humerus were slightly damaged and had to be reconstructed in the laboratory. The humerus seems to be the best preserved bone in the skeletal remains of Burial No. II. The surgical neck and the bicipital groove were all well developed and well preserved (pl. LX B). Supra condylar ridge was also clearly marked. The coronoid process and the olecranon fossa were deep and well marked. The trochlea was complete and in good condition.

The osteometric measurements on right and left humerus are given in Table-14.

Radius: Both the radius bones (Right and Left) were well preserved but out of the two, the left radius was still better preserved. The right bone was damaged at the diaphysial region post-mortemly but careful reconstruction yielded a nearly complete diaphysial region. The proximal end was slightly damaged. The expanded lower end of the right radius was missing (pl. LXI A).

Radius (Right): It is very well preserved bone with both the distal and proximal epiphysis intact. The diaphysial shaft was also complete. The anterior, posterior and interosseous borders were well defined.

Radius (Left): The upper end of the radius, which includes the head, was damaged to some extent. The radius tuberosity was well defined. The shaft was gently curved. The interosseous border was well developed. The expanded lower end of the radius was damaged to a great extent. The styloid process was broken.

The morphometric measurements on the right and left radius are given in Table-15.

Ulna (Right): Greater part of right ulna was damaged. A very small portion of the shaft was present. The entire distal end along with the shaft was missing. The upper end of the right ulna showed well preserved olecranon, coronoid process and two articular areas termed trochlear and radial notches.

Ulna (Left): A relatively better preserved bone with less post-mortem damages. The distal end was better preserved. The olecranon and coronoid process in the articular areas were well defined. The shaft

was in good condition along with the borders and surfaces. The proximal end was slightly damaged. The measurements on the right and left ulna are given in Table-16.

Femur (Right and Left): The proximal part of both the right and left femoral were slightly better preserved along with more than half of the shaft. The distal ends of both the femural bones were completely missing. The bones showed prominent marks of muscular attachment. The linea aspera is conspicuously present (pl. LXI B).

The morphometric measurements on both the femoral bones are given in Table-17.

Fibula (Right and Left): In both right and left bones only a small portion of the shaft was present. Therefore, no measurements were possible.

Tibia (Right and Left): The tibia bones were in a very fragmentary condition and veriy badly preserved.

Observations on Dentition: The teeth available from Burial No. II were in bad condition and worn out. Second and third molar from the lower jaw and third molar from the maxilla were lost post-mortemly. The right half of the upper jaw was damaged post-mortemly, resulting in a loss of medial incisors. The posterior teeth of both maxillary and mandibular rigion reveal the highest mesio-distal diameter. Crown module and robustness value indicate that the first and second molars are the most robust and largest (Table 19). Considering all the evidences, it is convincing to accept that such deep cusps indicated the degree to which masticatory apparatus was used rather than an indication of advanced age. It may not be too speculative to say that they may be consuming a good deal of hard food which may have caused such deep occlusal surface.

AGE AND SEX OF THE SKELETONS FROM BHAGWANPURA BURIALS

In the absence of well preserved pelvic bones, it is difficult to provide a good estimate of the age and sex of the Bhagwanpura remains. However, there are a few definite indications on the basis of which age and sex estimation may be made. In the Burial No.I. There is no definite demarcation between lesser and greater tubercle of humerus. Generally the fusion is completed around seventeen years. The head of the humerus was also not fused. The basilar suture was open indicating that it may be less than twenty years. The dentition was mixed with permanent and fully erupted first molar, lateral incisors and central incisors, deciduous second molar and the pre-molar teeth. On the basis of above observations it may be concluded that the age of the individual may be around ten years.

The skeleton appears to be that of a famale since there is a low degree of cresting and the glabella is smooth. The occipital ridges are feeble and less marked. The supra oribital ridges are smooth and delicate.

The skeleton from Burial No. II appears to belong to an adult of the age around 35 years. The basilar suture is closed. The squamous suture of the temporal was commencing obliteration. The parieto-mastiod suture was also not yet closed.

The skeleton from Burial No. II probably belongs to a male. The cranium was heavy, rugged and with conspicuous nuchal markings. The mandible was heavy associated with a prominent chin.

The morphometric analysis of the human skeletal remains from Bhagwanpura reveal similarity to broad general category of the Mediterraneans. However, because of the scanty material available, the observations must remains suggestive. Information especially on pre-historic and proto-historic human skeletal remains in India, is extremely inadequate to provide useful information on the ethnic affinities of the early populations. It would be somewhat speculative to comment on the ethnic affinities of the human remains from Bhagwanpura.

TABLE 1

Measurements on Bhagwanpura Skull from Burial I

Maximum Cranial length	179 mm
Maximum Cranial breadth	165 mm
Glabella inion length	165 mm
Nasion inion length	161 mm
Glabeella lambda length	175 mm
Nasion-basion length	87 mm
Length of foramen magnum	39 mm
breadth of foramen magnum	27 mm
Maximum frontal diameter	89 mm
Maximum frontal diameter	105 mm
Biauricular breadth	96 mm
Greatest occipital breadth	105 mm
Bimasoid breadth	89 mm
Basion-bregma height	138 mm
Horizontal circumference of skull	495 mm
Transverse Arc	301 mm
Longitudinal arc or mid-sagittal arc	386 mm
Frontal arch	135 mm
Parietal arch	126 mm
Occipital arc	121 mm
Frontal chord	120 mm
Parietal chord	117 mm
Occipital chord	103 mm
Facial length or facial depth	79 mm
Outer bi-orbital breadth	84 mm
Inner bi-orbital breadth	80 mm
Bizygomatic breadth	105 mm
Bimaxillary breadth	76 mm
Morphological facial height	94 mm
Morphological Superior facial height	57 mm
Orbital breadth	36 mm
Orbital height	33 mm
Nasal height	41 mm
Nasal breadth	20 mm
Maxillo-alveolar length	48 mm
Maxillo-alveolar breadth	51 mm

A MORPHOMETRIC ANALYSIS OF THE HUMAN SKELETAL REMAINS

Palatal length	39 mm
Palatal breadth	33 mm

Indices

Cranial Index	92.2
Vertical index or length-height	
Cranial index	77.1
Transverse vertical index or	
Breadth-height cranial index	83.6
Frontal index	53.9
Foramen magnum index	69.3
Facial index	89.5
Upper facial index	54.3
Nasal index	48.8
Palatal index	84.6

TABLE 2

<i>Measurement on lower Jaw or mandible</i>	
Bicondylar breadth	102 mm
Bigonial breadth	74 mm
Bi-mental breadth	41 mm
Length of Lower jaw	—
Chin height or symphysial height	21 mm
Condylar height or height of Ramus	41 mm

TABLE 3

Measurement (in mm)	CERVICAL VERTEBRAE						LUMBER VERTEBRAE		
	2	3	4	5	6	7	1	2	3
Anterior Height	11·0	6·0	6·5	6·0	7·2	8·0	15·0	15·0	15·7
Posterior Height	6·0	6·0	5·5	5·5	6·5	8·5	14·4	14·5	14·5
Middle Height	—	5·0	5·1	5·0	5·0	—	12·5	12·5	14·5
Anterior Diameter	—	10·0	10·1	10·2	11·1	11·7	29·7	—	18·5
Posterior Diameter	—	10·2	10·4	10·5	11·0	11·6	10·0	19·9	19·8
Anterior Transverse diameter	—	21·6	24·5	21·5	20·0	24·1	27·5	30·0	28·0
Posterior Transverse diameter	—	—	23·4	22·9	19·5	25·5	31·4	33·5	26·5
Saggital diameter of vertebral foramen	—	15·0	14·0	15·5	15·9	14·2	13·3	15·0	17·5
Transverse diameter of vertebral foramen	23·0	17·0	17·5	20·1	20·3	18·5	19·0	22·0	19·5

TABLE 4

<i>Measurements on the Humerus (Right)</i>	
Maximum length	damaged
Total length of humerus	damaged
Breadth of proximal epiphysis	31 mm
Breadth of distal epiphysis	damaged
Maximum diameter in the middle	12 mm
Minimum diameter in the middle	10 mm
Least girth of the shaft	40 mm
Girth in the middle of the shaft	38 mm
Maximum transverse diameter of head	23 mm
Maximum sagittal diameter of head	24 mm
Girth of head	74 mm
Breadth of trochlea	damaged
Breadth of capitulum	damaged
<i>Indices</i>	
Cross sectional index of shaft	91.7 mm
Cross sectional index of head	95.8 mm

TABLE 5

<i>Measurement of the radius (Right)</i>	
Maximum length	damaged
Physiological length	damaged
Least girth of shaft	28 mm
Transverse diameter of shaft	0.9 mm
Sagittal diameter of shaft	0.8 mm

TABLE 6

<i>Measurements of Ulna</i>		
	<i>Right</i>	<i>Left</i>
Maximum length	—	156 mm
Physiological length	—	145 mm
Girth of Ulna	—	24 mm
Breadth of olecranon	—	11.3 mm
Thickness of depth of olecranon	—	11.0 mm
Height of olecranon	—	0.90 mm
Anterior breadth of radial articular		
Surface or coroid process mm	—	13 mm
Posterior breadth of radial articular		
surface or coronoid process		
height of oleranon cap	—	0.5 mm
Transverse diameter	—	0.7 mm
<i>Indices</i>		
Caliber index	—	16.55 mm
Length-depth Index	—	107.58 mm
Cross-Section index of shaft	—	114.28 mm

TABLE 7

<i>Measurements of Femur</i>		
	<i>Right</i>	<i>Left</i>
Maximum length	Br.	Br.
Physiological length	Br.	Br.
Maximum Trochanter length	Br.	Br.
Physiological Trochanter length	Br.	Br.
Diaphysial length or shaft length	Br.	Br.
Sagittal diameter of the middle of shaft	16 mm	16 mm
Transverse diameter of middle of shaft	15 mm	15 mm
Girth in middle of shaft mm	44 mm	44 mm
Upper Transverse diameter of shaft mm	21 mm	20 mm
Upper lower saigtal diameter of shaft	Br.	Br.
Lower transverse diameter of shaft mm	—	23 mm
Anterior neck and Head length mm	42 mm	41 mm
Vertical diameter of Neck mm	22 mm	21 mm
Sagittal diameter (colum)	Br.	18 mm
Girth of neck	Br.	63 mm
Vertical diameter of head	Br.	Br.
Transverse of sagittal diameter of head	Br.	Br.
Girth of head	Br.	Br.

TABLE 8

<i>Measurements of Tibia (Right and Left)</i>		
	<i>Right</i>	<i>Left</i>
Maximum transverse diameter of tibia	20 mm	23 mm
Minimum transverse diameter of tibia	18 mm	19 mm
Transverse diameter in the middle of bone	13 mm	13 mm
Girth of shaft	45 mm	44 mm

TABLE 9

<i>Measurements of Fibula (Right and Left)</i>		
	<i>Right</i>	<i>Left</i>
Girth in the middle	25 mm	26 mm
Maximum diameter in the middle	8 mm	8 mm
Minimum diameter in the middle	5.5 mm	7.5 mm
Minimum girth of bone	6.7 mm	7.4 mm
Transverse diameter of Collum	6 mm	6 mm
Sagittal diameter of Collum	5.8 mm	5.6 mm

TABLE 10

<i>Diameter (mm) and Indices of Maxillary and Mandibular Teeth of Burial No. I</i>											
		Maxilla				Mandible					
Measurement/ Indices		M2 (Deciduous)	M1	P1	C	M2 (Deciduous)	M1	P1	C	I2	I1
1	2	3	4	5	6	7	8	9	10	11	12
Mesio-	R	9.1	12.0	7.2	—	10.1	11.1	8.7	—	6.0	5.8
distal	L	9.1	10.8	7.9	6.9	8.4	11.8	8.0	6.2	5.9	5.0
Bucco-	R	8.1	10.6	8.0	—	9.0	10.1	7.1	—	—	—
lingual	L	9.1	11.0	8.1	6.1	8.3	10.0	7.3	6.0	—	—
Crown	R	89.0	88.3	111.1	—	89.1	90.9	81.60	—	—	—
Index	L	101.1	101.8	102.5	88.4	98.8	84.7	91.2	96.7	—	—
Crown	R	8.6	11.3	7.6	—	9.5	10.5	7.9	—	—	—
Module	L	9.0	10.9	8.0	6.5	8.3	10.5	7.6	6.1	—	—
Robustness	R	73.7	127.2	57.6	—	90.9	119.1	61.7	—	—	—
Value	L	81.9	118.8	63.9	42.0	69.7	118.1	58.4	37.2	—	—

Key : M2 = Second Molar; M1 = First Molar; P1 = First pre-molar; C=Canine;

I2 = Lateral Incisor; I1 = Central incisor;

R = Right; L= Left side of the jaw; — tooth is missing.

TABLE 11

<i>Measurements on the skull from Burial No. II</i>	
Maximum cranial length	185.0 mm
Glabella-inion length	181.0 mm
Nasion inion length	17.0 mm
Basion-prosthion length or facial depth	105.0 mm
Length of foramen magnum	42.0 mm
Breadth of foramen magnum	26.0 mm
Bi-auricular breadth	107.0 mm
Bi-mastoid breadth	92.0 mm
Basion-bregma height	147.0 mm
Longitudinal arc or Mid-sagittal arc	396.0 mm
Frontal arc	148.0 mm
Occipital Chord	111.0 mm
Morphological superoinferior facial height	71.0 mm
Orbital breadth	38.0 mm
Orbital height	45.0 mm
Nasal height	50.0 mm
Minimum frontal breadth	94.0 mm
<i>Indices</i>	
Vertical index or length-height cranial index	77.3
Foramen magnum index	61.9

TABLE 12

Measurements on lower jaw of Burial No. II

Bigonial breadth	82.0 mm
Bimental breadth	46.0 mm
Length of lower jaw	74.0 mm
Chin height or Symphyseal height	30.0 mm
Condylar height or height of ramus	69.0 mm
Gonion angle	134°
Minimum breadth of ramus	35.0 mm
Height of the body of the mandible	62.0 mm
Maximum thickness of the body of the mandible	17.5 mm

TABLE 13
Measurements (mm) on Cervical, Thoracic and Lumbar Vertebral

Measurements (in mm) Lumber	Cervical			Thoracic							
	1	2	3	1	2	3	4	5	6	1	2
Anterior height	11.0	13.5	13.5	16.5	17.5	17.5	14.0	14.5	12.5	20.0	20.5
Posterior height	12.0	13.0	13.0	15.5	18.0	18.0	13.0	15.0	12.0	18.0	18.5
Middle height	7.0	8.5	8.0	13.5	14.5	14.0	11.5	12.0	9.5	15.0	15.5
Anterior diameter	15.0	15.0	15.5	21.5	23.5	21.5	15.0	18.0	16.0	24.0	24.5
Posterior diameter	16.0	13.0	13.5	22.0	24.0	23.5	18.0	19.0	16.5	23.0	23.5
Anterior transverse diameter	19.5	23.5	20.0	23.5	27.0	25.5	27.5	24.0	26.0	26.5	×
Posterior transverse diameter	19.5	23.5	20.5	27.0	28.0	27.5	31.5	26.0	27.0	27.0	30.0
Middle transverse diameter of vertebral body	16.0	13.5	14.0	22.0	26.0	23.0	24.5	23.0	21.0	23.0	×
Sagittal diameter of vertebral body	14.0	14.0	14.5	17.5	20.5	10.5	18.5	18.0	16.0	17.5	18.0
Transverse diameter vertebral foramen	24.0	23.0	23.5	19.5	20.0	18.5	21.5	20.0	23.0	17.0	×

TABLE 14

<i>Measurements on Humerus</i>		
	<i>Right</i>	<i>Left</i>
Maximum length	287.0 mm	284.0 mm
Total length of humerus	281.0 mm	280.0 mm
Breadth of proximal epiphysis	45.0 mm	47.0 mm
Breadth of distal epiphysis	51.0 mm	50.0 mm
Maximum diameter in middle	19.5 mm	19.6 mm
Minimum diameter in middle	13.5 mm	13.4 mm
Least girth of shaft	54.0 mm	54.0 mm
Girth in the middle of shaft	59.5 mm	59.2 mm
Maximum transverse diameter of head	34.0 mm	—
Maximum sagittal diameter of head	36.0 mm	37.0 mm
Girth of head	120.0 mm	122.0 mm
Breadth of Trochles	37.5 mm	36.0 mm
Breadth of Capitulum	14.0 mm	14.0 mm
Breadth of olecranon fossa	22.5 mm	22.5 mm
Depth of capitulum	21.5 mm	22.0 mm
Depth of Trochlea	16.5 mm	17.0 mm
<i>Indices</i>		
Cross-section index of shaft	69.23 mm	68.36 mm
Cross-section index of head	94.4 mm	—
Angle of torsion	23.0 mm	21.0 mm

TABLE 15
Measurements on Radius

	<i>Right</i>	<i>Left</i>
Maximum length	214 mm	—
Physiological length	209 mm	—
Least girth of shaft	37 mm	36.5 mm
Transverse diameter of shaft	0.9 mm	0.9 mm
Sagittal diameter of shaft	15.0 mm	15.0 mm
<i>Angles</i>		
Torsion angle	28°	

TABLE 16
Measurements on Ulna

	<i>Right</i>	<i>Left</i>
Maximum length	—	234 mm
Physiological length	—	219 mm
Girth of Ulna	—	39 mm
Breadth of olecranon	20.0 mm	19.5 mm
Thickness or depth of olecranon	10.5 mm	11.0 mm
Height of olecranon	22.5 mm	19.6 mm
Anterior breadth of radial articular surface on coronoid process	19.0 mm	19.5 mm
Height of olecranon cap	4.5 mm	4.5 mm
Transverse diameter	19.5 mm	21.0 mm
<i>Indices</i>		
Caliber index	—	17.8 mm
Length-Depth index	—	106.8 mm

TABLE 17
Measurements of Femur

	<i>Right</i>	<i>Left</i>
Sagittal diameter of middle of the shaft	26.1 mm	24.6 mm
Transverse diameter of middle of the shaft	22.2 mm	22.5 mm
Girth of middle of the shaft	77.0 mm	76.0 mm
Upper transverse diameter of the shaft	39.0 mm	36.0 mm
Upper sagittal diameter of the shaft	23.5 mm	23.0 mm
Anterior neck and head length	57.5 mm	58.0 mm
Vertical diameter of neck	27.5 mm	27.7 mm
Sagittal diameter of neck	19.0 mm	19.5 mm
Girth of neck	89.5 mm	90.5 mm
Vertical diameter of head	38.0 mm	39.5 mm

TABLE 18
Measurements on Tibia

	<i>Right</i>	<i>Left</i>
Maximum diameter in middle bone	—	23·0 mm
Transverse diameter in middle of bone	—	19·0 mm
Girth of the shaft	—	73·0 mm

TABLE 19
Diameter (mm) and Indices of Maxillary and Mandibular Teeth of Burial No. 2

		Maxilla				Mandible				
Measurements/Indices		M2	M1	P2	I2	M1	P2	P1	C	I2
Mesiodistal	R	9.5	10.0	7.0	9.0	9.0	4.5	7.0	6.0	6.5
	L	—	—	—	8.5	10.0	4.0	6.0	6.0	6.5
Buccolingual	R	10.0	11.0	7.0	—	9.5	8.5	7.5	5.5	—
	L	—	—	—	—	9.5	8.0	8.0	5.0	—
Crown Index	R	105.2	110.0	100.0	—	105.5	188.8	107.1	91.6	—
	L	—	—	—	—	95.0	200.0	133.3	83.3	—
Crown Module	R	9.7	10.5	7.0	—	9.2	6.5	7.2	5.7	—
	L	—	—	—	—	9.7	6.0	7.0	5.5	—
Robustness Value	R	95.0	110.0	49.0	—	85.5	38.2	52.0	33.0	—
	L	—	—	—	—	95.0	32.0	48.0	30.0	—

Key : M2 = Second Molar; M1=First Molar; P1=First Pre-molar; C=Canine; I2=Lateral inciser.

CHAPTER XIV

**THERMOLUMINESCENCE DATING OF POTTERIES
EXCAVATED AT BHAGWANPURA**

K.S.V. Nambi, R. Sasidharan and S.D. Soman

CHAPTER XIV

THERMOLUMINESCENCE DATING OF POTTERIES EXCAVATED AT BHAGWANPURA

ABSTRACT

Thermoluminescence (TL) dating attempts were made on sherds of freshly excavated potteries from Bhagwanpura. TL measurements were generally made from the fine grains of the potsherds; attempts were also made to separate the quartz inclusions from some of the potsherds and evaluate the TL.

The TL age estimates ranged between 2000 and 5000 years B.P. for the Bhagwanpura series. Distinctly different trends were seen in the ages of grey wares and red wares from Bhagwanpura; with increasing depth at the site, the grey ware ages diminished (upto 1.3 m depth beyond which they do not occur) while the red ware ages remain the same upto 1.3 m depth and increase regularly beyond.

The estimated accuracies of the TL ages range between ± 9 to $\pm 19\%$ and such a high value stems from the generous allowance made for all possible values of water content in pottery and soil over the archaeological period; if reasonable values for the actual degree of wetness could be provided, the TL ages can be estimated with accuracies of the order of $\pm 5\%$.

1. INTRODUCTION

Radiation dosimetry by thermoluminescence (TL) has found a very important application in archaeological dating of ancient potteries.¹ The increasing enthusiasm shown by TL workers in developing viable techniques for dating has culminated in an exclusive international seminar on TL dating recently at Oxford², the deliberations of which gave the impression that TL dating in archaeology has come to stay.

The dating attempts were initiated in the TL dosimetry laboratories of Health Physics Division of BARC during 1974 at the instances of a persistent demand by a retired archaeological scientist,³ who provided the first set of authentic ancient potteries. The preliminary investigations done on these handful of museum potteries were very encouraging⁴ and the Archaeological Survey of India, New Delhi offered to provide us with freshly excavated pottery pieces along with adjoining soil samples to enable us to pursue our efforts in standardising TL methods of dating ancient Indian potteries. This report details the investigations undertaken on samples excavated at Bhagwanpura (Kurukshetra District, Haryana State) and presents the TL dates obtained.

¹ M.J. Aitken and S.J. Fleming, 'Thermoluminescent dosimetry in archaeological dating' in *Topics in Radiation Dosimetry*, (ed.) F.H. Attix, New York, 1972, pp. 1-78.

² M.J. Aitken, 'Radon loss evaluation by alpha counting', *PROC. OF SPECIALISTS TL SEMINAR HELD AT OXFORD*, to be published in *PACT Journal* (1979).

³ S. Paramasivan, 'Scientific investigations on ancient materials', a memorandum submitted to Bhabha Atomic Research Centre, Bombay, 1973.

⁴ R. Sasidharan, K.S.V. Nambi and R. Parthasarathy, 'Thermoluminescent dating of ancient Indian potteries', *Proc. National Symp. on TL and its appls.* (BARC), 1975, pp. 649-69.

2. PRINCIPLE OF TL DATING

A summary of the general principles on which the TL dating of potteries are based, has been published by Aitken *et. al.*⁵ and Fleming⁶. The starting of the 'TL clock' is considered to be the time of firing of the pottery specimen. Whatever TL had been stored in the material due to internal and external irradiations through the geological period of existence of the pottery-constituents is erased during the firing when the temperature could reach anywhere between 700°C to about 1100°C. Thus, the age arrived at by measuring the TL accumulated since the time of firing is truly representative of the archaeological age from historian's point of view (assumption: the pot has not seen higher than ambient temperatures during this intervening period). The TL from the pottery is mostly due to some TL-sensitive mineral inclusions in the fine grained clay⁷ matrix. Table-1 gives the results of a petrographic study on ten Indian pottery pieces and Table-2 presents the results of a microprobe study⁸ of pottery fine grains. Both these results indicate that quartz, a small known TL sensitive mineral, could be the chief TL emitting constituent of the pottery whether in coarse or fine grains. The established practice is to make TL measurements either from separated quartz inclusions (QI) or from the fine grains (FG) as such.

TABLE 1
A Petrographic study of ancient Indian Potteries

Sample Code	Composition % wt			
	Minerals in coarse grains			Fine grains
	Quartz	Feldspar	Plagioclase	
1	2	3	4	5
P1	24.0	0.4		74.0
P2	15.0	fluorite: 3.0		80.0
P3	24.0		3.0	72.0
P4	8.0			89.0
P5	17.0	4.0		78.0
P6	16.0		5.4	74.0
P7	23.1		4.4	71.5
P9	31.0			69.0
PRL-1	11.0		7.6	74.7

⁵ M.J. Aitken, D.W. Zimmerman and S.J. Fleming, 'Thermoluminescent dating of ancient pottery', *Nature*, 219 (1968), pp. 442-5.

⁶ S.J. Fleming, Thermoluminescent dating: principles and applications, *Naturwissenschaften* (58, 1971), pp. 33-8.

⁷ N.K. Rao, 1975, Private Communication.

⁸ A.K. Singhvi, and D.W. Zimmerman, 'The minerals responsible for thermoluminescence in fine grain samples' *PROC. SPECIALISTS SEMINAR ON TL DATING, OXFORD*, to be published in *PACT Journal* (1979), Council of Europe, Strausborg.

TABLE 2
A Microprobe study of fine grains of Potteries

Total no. of samples : 24
Total no. of grains : 260

Mineral identified	number of fraction
Quartz	45%
K-Feldspar	36%
Plagioclase	15%
Apatite	4%
Zircon	<1%

The following flow charts summarise the basic principles involved and the various options available in TL dating :

Chart 1: TL Dating : Basic Principle

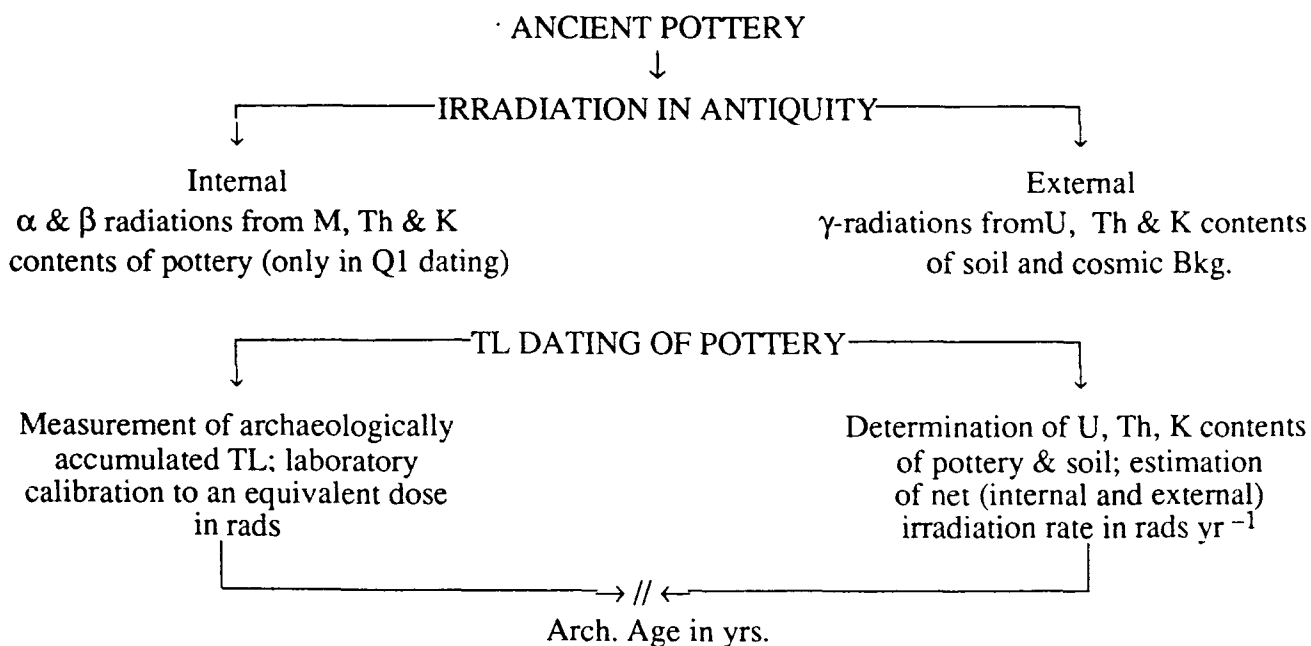


Chart II : Dose-rate derivation TL dating

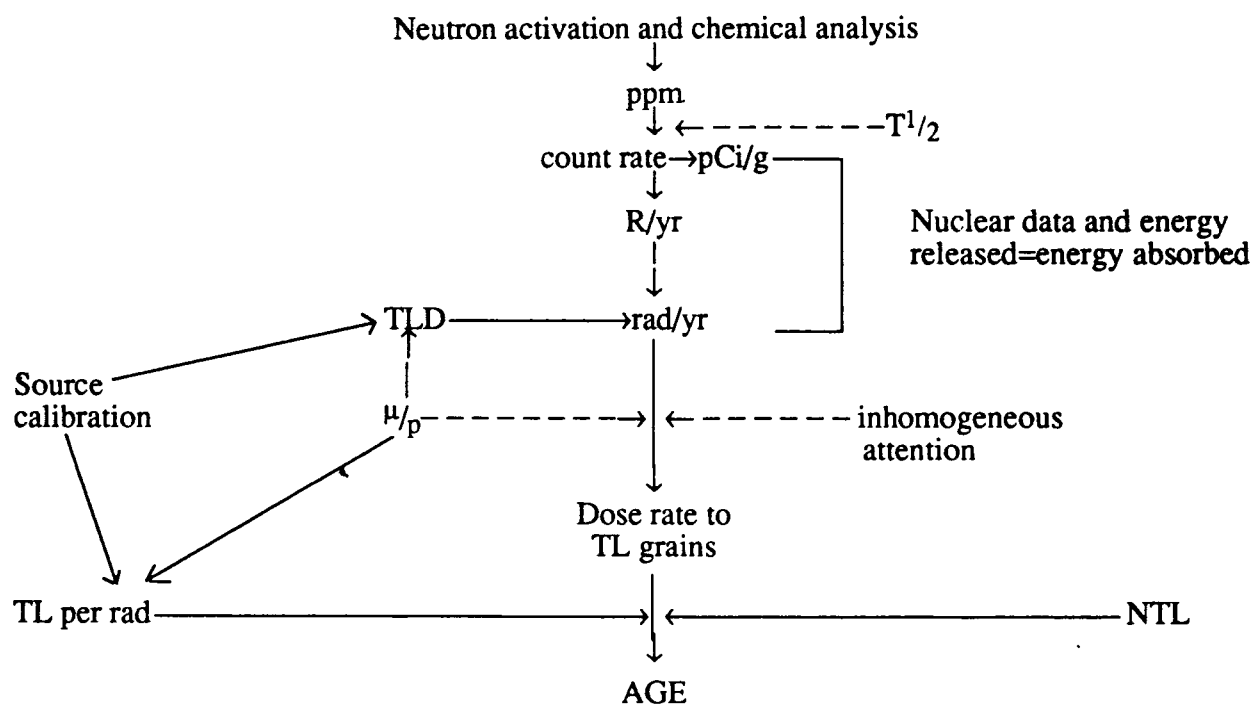
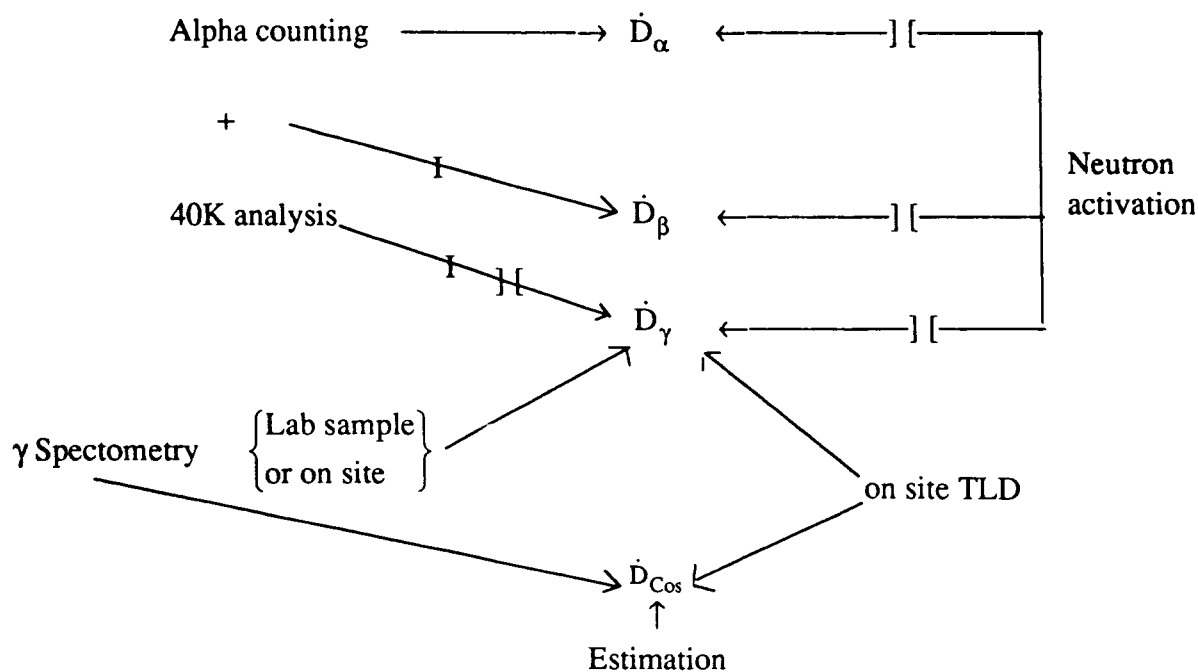


Chart III : Dose-rate evaluation systems in TL Dating



Where $\left. \begin{matrix} \dot{D}_\alpha \\ \dot{D}_\beta \\ \dot{D}_\gamma \end{matrix} \right\}$ are annual dose rates due to α , β and γ respectively.

I—estimation bad due to abnormal Th/u weight ratio.

II—estimation bad due to disequilibrium in Th, U chains.

3. INSTRUMENTS AND SAMPLES

3.1 TL Reader: The TL instrument used for archaeological dating has been developed in our laboratories and described by Samant *et. al.*⁹ The heating rate employed was about $680^\circ\text{K min}^{-1}$ and a filter combination of Chance-Pilkington HA-3 and OX-1 filters was used to improve the signal to noise ratio in the high temperature region of the TL glow curve. Oxygen-free nitrogen gas was flown at a rate of 2.5 l min^{-1} in the sample-photomultiplier (EMI 9514S) compartment of the apparatus to eliminate spurious TL.

3.2 Radiation Sources for Calibration : A ^{60}Co gamma cell and a plated ^{241}Am source were respectively employed for obtaining artificial gamma and alpha irradiations of the potteries in the laboratory. The useful dose rates delivered at the sample for a fixed geometry were determined using secondary standards with an estimated accuracy of about $\pm 2\%$.

3.3 Radioactivity Measurements : The gross alpha activities (from and Th impurities) of the samples were determined by the 'Thick source counting technique' as adopted by Turner *et. al.*¹⁰ ZnS (AgNi) phosphor powder is sprinkled on a cellotape fixed on a perspex ring with an inner diameter of 42 mm (equal to the photocathode diameter of the Photomultiplier used for counting); powdered pottery samples after drying are filled above the ZnS coating inside the ring to a height of about 2.3 mm and the sample is placed with ZnS-cellotape side directly on the photomultiplier face for alpha counting. After overnight counting, the sample is sealed with cellotape at the top and counting continued for another overnight to get an indication of any continuous radon escape from the sample. The sealed count rate is once again determined after about 14 days to get an indication of any existence of disequilibrium conditions in the beginning. The discriminator employed in the counter is such that the efficiency of alpha counting is about 85% respectively for the natural Th and chains in equilibrium¹¹.

^{40}K estimations were done from K analysis by atomic absorption spectroscopy. In the case of soil samples which could be available in large quantities, ^{40}K estimations were done directly from gamma spectrometry. The uncertainties in ^{40}K estimations are in the range of $\pm 5\%$.

⁹ R.K. Samant, P.V. Kumar, D.T. Khatri and K.S.V. Nambi, 'A versatile TL reader for research and dosimetry, Paper no. 3/156, First Asian Regional Congress on Radiation Protection,' IARP (BARC, Bombay, 1974).

¹⁰ R.C. Turner, J.M. Radley and W.V. Mayneord, 'A new method of total alpha counting', *Brit J. Radiol.* 31 (1958), pp. 397-406.

¹¹ Aitken and S.G.E. Bowman, 'Thermoluminescent dating: assessment of alpha particle contribution', *Archaeometry*, 17 (1975), pp. 132-8.

3-4 *Samples* : Potsherds carefully collected(see Annexure I) from freshly excavated potteries along with adjoining soil were provided by the Archaeological Survey of India, New Delhi.¹² The first set of 18 samples were from different layers the same excavation site at Bhagwanpura (Table-3).

TABLE 3
Archaeologist's description of samples from Bhagwanpura site

<i>Our Code No.</i>	<i>Locus</i>	<i>Depth (in m)</i>	<i>Layer</i>	<i>Object</i>
BPR-1	C-2, Baulk	0.30	3	Fragment of a dish (Grey)
BPR-2	C-1, Qd2	0.80	4	Pottery (Grey)
BPR-3	C-1, Qd2	0.80	4	Sherd (Grey)
BPR-4	C-2 Baulk	0.55	Upper level of 4	RW sherds
BPR-5	C-2 Baulk	0.55	4	GW sherds
BPR-6	C-2 Baulk	0.55	4	RW sherds
BPR-7	C-2 Baulk	0.55	4	RW Sherds
BPR-8	C-1, Qd2	0.90	5	GW sherds
BPR-9	C-1, Qd2	1.10	6	GW sherds
BPR-10	C-1, Qd2	1.15	6	RW sherds
BPR-11	C-1, Qd2	1.18	6	RW sherds
BPR-12	C-1, Qd2	1.18	7	RW sherds
BPR-13	C-1, Qd2	1.40	7	RW sherds
BPR-14	C-1, Qd2	1.60	8	RW sherds
BPR-15	C-1 Qd2	2.10	9	RW sherds
BPR-16	C-1, Qd2	2.25	10	RW sherds
BPR-17	C-1, Qd2	2.40	10	RW sherds
BPR-18	C-1, Qd2	2.45	10	RW sherds

RW : Red Ware; GW : Grey Ware

4. EXPERIMENTAL PROCEDURES

4.1 *Sample Preparation* : Generally the outer 1.2 mm layer of the surfaces of each potsherd is gently filed away to get rid of (in final analysis) any uV induced TL effects and the TL contributions of beta radiations from the surrounding soil. From measurements of TL, the Fine Grain (FG) technique

¹² J.P. Joshi, vide D.O. No. 29/24/75-M, 1975, Archaeological Survey of India, New Delhi.

of Zimmerman¹³ was usually employed and the Quartz Inclusion (QI) technique of Fleming¹⁴ was occasionally employed additionally, depending upon the availability of sufficient quartz grains for the studies. The procedures adopted are briefly summarised in the following two sub-sections.

4.1.1 FG technique : The surface shaved pot sherds are gently squeezed between the flat faces of a vice so as to break up the pottery piece into its natural major constituents viz., fine clay material and bigger mineral inclusions. The viced material is poured onto a 6 cms high acetone column in a wide-mouthed test tube, shaken vigorously, allowed to stand for 2 mins and the superintant poured into another test tube and allowed to stand for 20 mins; the fine grains thus settled at the bottom are usually in the 1-8 mm sizes which are taken in a fresh acetone suspension and then poured in equal volumes into small test tubes (20 nos) each containing in aluminium disc (9 mm dia and 0.028" thick). The test tubes are initially filled to about 2 cms of acetone so that the discs are not disturbed when fine grain-acetone suspension is poured in. The acetone column is allowed to evaporate undisturbed under ambient conditions in darkness and the suspension-coated aluminium discs are used individually for TL measurements by placing directly on the heater place of the TL reader. The reproductibility of readings from disc to disc is usually within $\pm 5\%$.

4.1.2 QI technique : The fraction of viced material collected between 80 and 140 Tyler mesh sieves is 'magnetically cleaned' using a desk magnet and the non-magnetic part is kept in 48% HF acid for an hour. The clean white crystalline extract thus obtained usually contains quartz grains of about 100 m sizes. These are washed and dried (warning not to exceed 40 ~ 50° C). Usually 5 mgms of these grains are used for any TL reading.

4.1.3 TL measurements : From both FG and QI samples, TL measurements are usually made in the following stepwise procedure :

- i) The natural thermoluminescence (NTL) from the virgin samples (at least 5 nos.) are measured ;
- ii) At least two different artificial gamma irradiations are given to pairs of virgin samples such as the TL output in the NTL region is approximately twice and thrice the NTL output-called measurement of ATL glow curves for the cases of (NTL + γ_1) and (NTL + γ_2).
- iii) Repetition of step (ii) but with alpha irradiation ;
- iv) NTL erased samples from step (i) are given small incremental gamma doses and the TL glow curves recorded called second glow measurements.

Sets of typical TL glow curves obtained are presented in figures 1, 2 and 3.

5. CALCULATIONS

5.1 The plateau test : From a pair of ATL and NTL glow curves, the ratio of the ordinates at regular temperature intervals is calculated and plotted against respective temperature to yield a plateau. The

¹³ D.W. Zimmerman, 'Thermoluminescence dating using fine grain from pottery', *Archaeometry*, 13 (1971), pp. 29-52.

¹⁴ S.J. Fleming, 'Thermoluminescence dating: refinement of the quartz inclusion method', *Archaeometry*, 12 (1970), pp. 135-45.

plateau indicates the temperature region of the glow curve which is devoid of any fast fading components from overlapping peaks in the TL outputs; all TL outputs are always measured only in this temperature region for purposes of calibrating the NTL from the ATL.

5.2 Archaeological dose estimation : While the negative X-axis intercept of the straight line fit for NTL, $(NTL + \gamma_1)$ and $(NTL + \gamma_2)$ points provide the first estimate of the NTL dose 'Q', the plot of the 'second glow' measurements yield the 'non-linearity' correction if any, 'I', and the equivalent archaeological gamma dose is given by,

$$E D_\gamma = Q + I \text{ rads} \quad \dots\dots (1)$$

It is claimed¹⁵ essential that the linear portions of the plots of the two sets should be parallel. We tend to believe that this is so only for the quartz inclusions; in fine grain samples, the colour of the sample is likely to undergo significant changes thus changing the 'TL' transparency' from the first heating and parallelism may not be obtained from the second runs.

5.3 'k' factor : This is determined as the ratio of the slopes of the straight lines obtained from the first glow measurements after alpha and gamma irradiations. (this is required to be done only on FG samples as the alpha dose contribution to the TL in quartz inclusions is negligible). As the TL effectiveness for alpha irradiations is quite low compared to the beta and gamma irradiations (considered equal) and since the archaeological dose is calibrated in terms of an equivalent gamma dose, it is necessary that the alpha dose rate should be weighted by the 'k' factor in age calculations.

5.4.1 Dose rate evaluations : Alpha and beta dose rates contributed by the pottery radioactive are estimated from the gross alpha count rates and potassium analysis. The alpha and beta dose rates due

Chart II : Dose-rate derivation in TL dating

to Th and U impurities are calculated from the true gross alpha surface emission rate, C_α^P alphas $\text{cm}^{-2} \text{hr}^{-1} \text{as}$

$$\dot{D}_{\alpha, \text{Th, U}}^P = 500 \cdot 6 C_\alpha^P \pm 3 \cdot 3\% \text{ mrad yr}^{-1} \quad \dots\dots(2)$$

$$\text{and } \dot{D}_{\beta, \text{Th, U}}^P = 23 \cdot 0 C_\alpha^P \pm 18 \cdot 3\% \text{ mrad yr}^{-1} \quad \dots\dots(3)$$

The constants in the above equations refer to conversion factors obtained at Th/U ratio of 3.55; the extent of variations possible when the actual Th/U ratio lies anywhere between 0 and are indicated by the percentage factors.¹⁶ The beta dose rate due to ^{40}K is calculated from the percentage content (K^P%) of K_2O in pottery :

¹⁵ M.J. Aitken and S.J. Fleming, 'Thermoluminescent dosimetry in archaeological dating' in *Topics in Radiation Dosimetry*, F.H. Attix (ed.), (New York, 1972), pp. 1-78.

¹⁶ R. Sasidharan, Sunta and K.S.V. Nambi, 'TL dating: error implications in case of undermined Th-U concentration ratio in pottery samples', *Ancient TL*, No. 2 (1978), pp. 8-11.

$$\dot{D}_{B, K}^P = 68 \cdot 2 K^P \text{ mrad yr}^{-1} \quad \text{.....(4)}$$

5.4.2 *Gamma dose rates contributed by soil* from its Th, U, and K contents are estimated as

$$\dot{D}_{\alpha, \text{Th, U}}^S = 27 \cdot 5 C_{\alpha}^S \pm 22 \cdot 5\% \text{ mrad yr}^{-1} \quad \text{.....(5)}$$

$$\dot{D}_{\alpha, K}^S = 20 \cdot 5 K^S \text{ mrad yr}^{-1} \quad \text{.....(6)}$$

Where the various symbols follow the same pattern as in section 5.4.1.

5.4.3 *The cosmic ray background contributions* to the gamma dose rate on the pot sherd is assumed from published values for the particular burial depth. This ($D^{\circ} \cos$) usually ranges from about 30 mrad yr⁻¹ on the ground surface to about 12 mrad yr⁻¹ at depth of 1 m and beyond¹⁷.

5.4.4 *If TLD capsules are employed at the site*, the TLD results provide directly the total gamma dose rates due to soil and cosmic radiations. However, the severe energy dependence characteristics of CaSO₄ : Di phosphor calls for proper correction factors to be applied to obtain quartz equivalent gamma absorbed doses applicable to dating calculations¹⁸. The self-dose due to radioactive impurities in the TL phosphor should also be taken into account either from the gross alpha count rates and K analysis or by suitable use of control TLDs kept inside thick lead shielded containers.

5.4.5 *Corrections for radon escape from the pottery/soil samples* are necessary as the gas escape if present, affects significantly the dose rates¹⁹. Such corrections could not be evaluated in the present investigations for want of the necessary gas-cell counting apparatus. However, a criterion for identifying samples which may be prone to significant radon losses was employed; if the mean alpha count rate in the 24 hours immediately after sealing the sample exceeds that in the unsealed state by more than 10%, the sample is likely to be prone to excessive radon escape when in dry state and hence the TL age estimates are likely to be erroneous, if the actual wetness conditions are not known.

5.4.6 *Corrections for wetness of pottery/soil samples* are necessary as the actual dose rates are somewhat lower under wet conditions. However in most of the cases, the degree of wetness of the burial site over geological climatic conditions is very difficult to know. In practice, there are only two alternative available to take this effect into account reasonably :

(i) If TLDs are left buried at site atleast for one full year, the actual gamma dose registered by TLD can be reasonably assumed to give the effective dose rate value over a full cycle of annual seasonal variations in the wetness of the soil;

¹⁷ Aitken *et. al.*, *op.cit.*

¹⁸ V. Mejdahl, 'Measurements of environmental radiation at archaeological excavation site', *Archaeometry*, 12 (1970), pp. 147-59.

¹⁹ Aitken, *op.cit.*, 1978.

(ii) The saturation wetness of the pottery/soil can be measured in the laboratory as :

$$W = \frac{\text{saturated wet weight} - \text{dry weight}}{\text{dry weight}} \times 100\% \quad \dots\dots(7)$$

and the degree of wetness under actual burial conditions (F) may be expected to vary within 0.5 ± 0.5 of the saturation water content. The correction factors to obtain the various components of the dose rates are $(1 + 0.015 W^{PP})^{-1}$ for \dot{D}_α^P , $(1 + 0.0125 W^{PP})^{-1}$ for \dot{D}_β^P and $(1 + 0.0114 W^{SF})^{-1}$ for \dot{D}_α^{20} .

5.4.7 *Correction for beta ray attenuation in the grains* is necessary only for Q1 dating calculations as the beta rays is attenuated significantly in the 100 um sizes of quartz grains usually employed for the TL measurements. The appropriate correction factor has been claimed to be 0.95²¹.

5.4.8 *Correction for mismatching of gamma dose rate estimations by radioactivity analyses and TLD evaluations* has been experimentally realised to be necessary²² though not well understood. TLD estimation has always been experimentally found to yield dose rate values from natural Th and U about 20% less than the values obtainable from gross alpha count rates. It has been recommended that such discrepancy be taken into account by increasing the TLD estimated gamma dose rate values by 1% and decreasing by 10% the gamma dose rate obtainable from gross alpha.

5.4.9 *The final dose rate equations employed in the present investigations* taking into account of all the aforesaid corrections are as follows :

$$\dot{D}_{\alpha, \text{Th, U}}^P = \frac{500 \cdot 6 \alpha^P}{1 + 0.0075 W^P} \text{ mrad yr}^{-1} \quad \dots\dots(8)$$

$$\dot{D}_{\beta, \text{Th, U}}^P = \frac{23b C_\alpha^P}{1 + 0.00625 W^P} \text{ mrad yr}^{-1} \quad \dots\dots(9)$$

where b = 1 for FG & b = 0.95 for QI

$$\dot{D}_{\beta, K}^P = \frac{68.2 b K^P}{1 + 0.00625 W^P} \text{ mrad yr}^{-1} \quad \dots\dots(10)$$

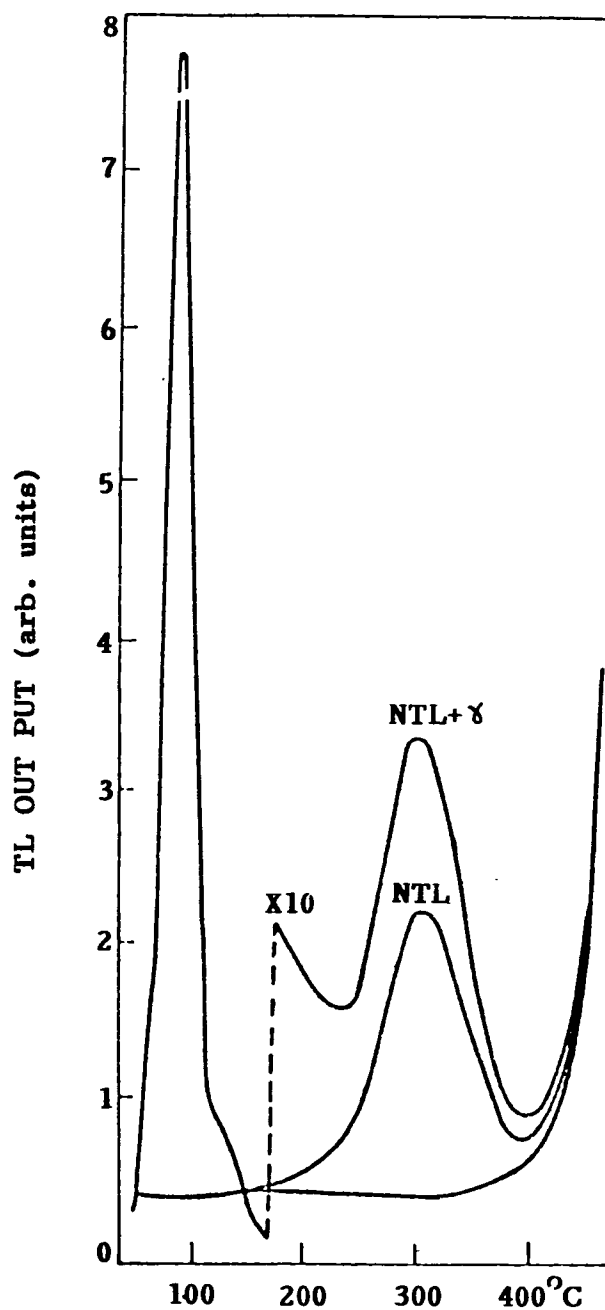
$$\dot{D}_{\alpha, K}^S = \frac{20.5 K^S}{1 + 0.0057 W^S} \text{ mrad yr}^{-1} \quad \dots\dots(11)$$

$$\dot{D}_{\beta, K}^S = \frac{24.75 C_\alpha^S}{1 + 0.0057 W^S} \text{ mrad yr}^{-1} \quad \dots\dots(12)$$

²⁰ M.J. Aitken, 'Thermoluminescent age evaluation and assessment of error limits; revised system', *Archaeometry* 18 (1976), pp. 233-8.

²¹ M.J. Aitken and V. Mejdahl, Proc. of A Specialists Seminar on TL dating, Oxford (1978).

²² M.J. Aitken and V. Mejdahl, Proc. Specialists TL Seminar (Oxford, 1978), Thermoluminescence dating: beta dose attenuation in quartz grains, paper no. 62.



**TYPICAL TL GLOW CURVES FROM
THE QUARTZ GRAINS EXTRACTED
FROM ANCIENT INDIAN POTTERIES.**

FIG. 43

$$\dot{D}_{\cos} = 12 \sim 30 \text{ mrad yr}^{-1} \text{ depending on depth} \quad \dots\dots(13)$$

alternatively, instead of (11), (12) & (13)

$$\dot{D}_{r, Th, U}^S = 1 \cdot 1 \left[\dot{D}_{LTD} (\dot{D}_{\cos} + \dot{D}_{\alpha, K}) \right] \text{ mrad yr}^{-1} \quad \dots\dots(14)$$

5.4.10 The TL age is calculated from the equation,

$$TL_{age}^{FG} = \frac{1000 ED_{\gamma}}{k \dot{D}_{\alpha} + \dot{D}_{\beta} + \dot{D}_{\gamma} + \dot{D}_{\cos}} \text{ years, B.P.}$$

$$\text{and } TL_{age}^{QI} = \frac{1000 ED_{\gamma}}{\dot{D}_{\beta} + \dot{D}_{\gamma} + \dot{D}_{\cos}} \text{ years B.P.}$$

$$\text{where } D_{\alpha} = \dot{D}_{\alpha, Th, U}^P : \dot{D}_{\beta, Th, U}^P + \dot{D}_{\beta, K}^P = \dot{D}_{\beta}$$

$$\dot{D}_{\gamma} = \dot{D}_{\gamma, Th, U}^S + \dot{D}_{\gamma, K}^S$$

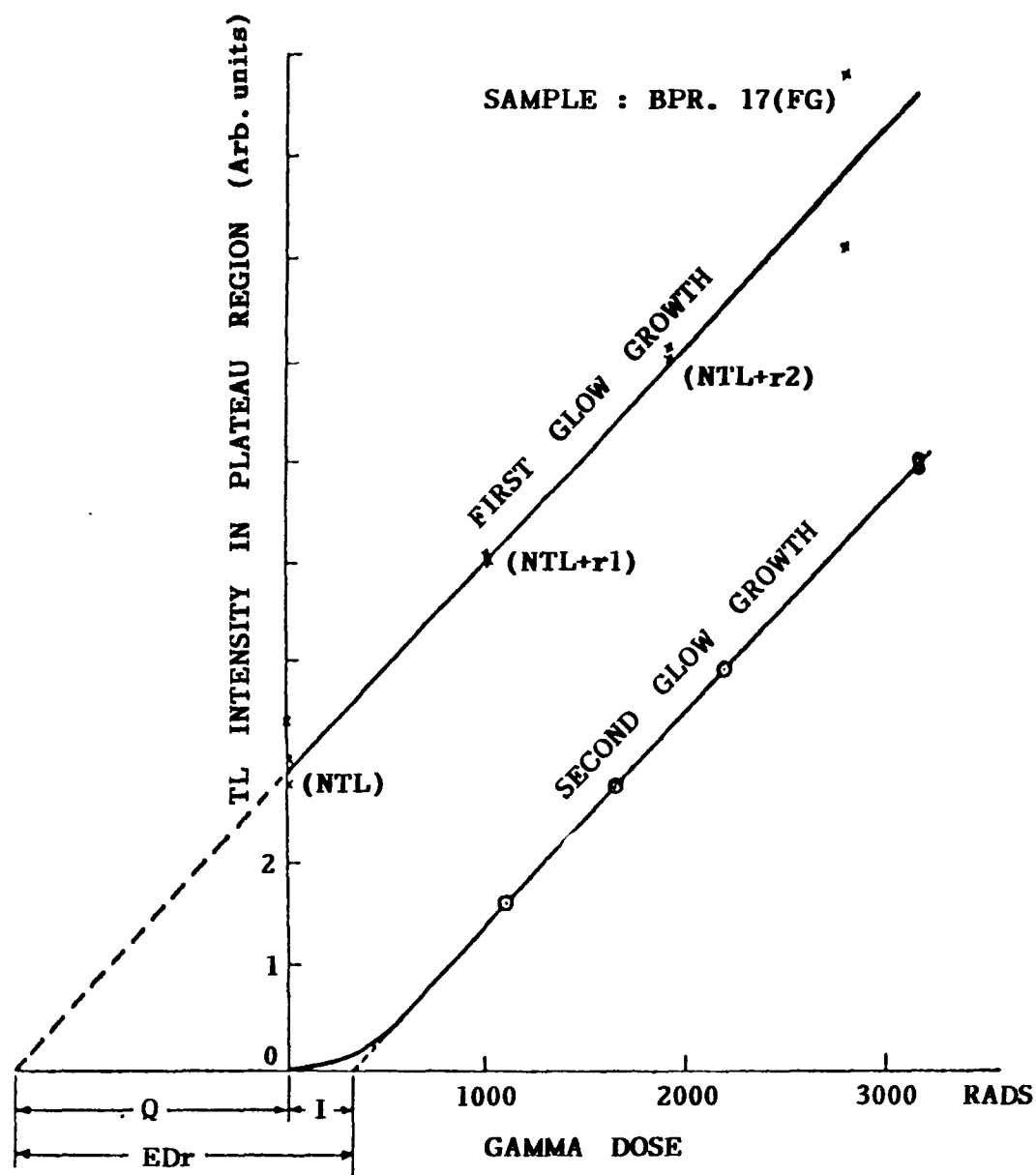
FIGS. 43, 44, 45

6. RESULTS AND DISCUSSIONS

The true gross alpha surface emissions rates and potassium analysis results for the potteries and adjoining soils are present in tables 4 and 5 for the Bhagwanpura series. The various components of the dose rate estimates and the k-factor value along with the archaeological dose estimates are presented in table 5. The archaeological dose estimates and the calculated TL age values are presented in table-6. The error estimates have been made as detailed in Annexure II. Where sufficient quantity for potsherds were available, as happened in the Bhagwanpura series, both FG dating and QI dating methods were employed to obtain TL ages; sometimes more than one estimate could be done by the FG dating itself. In such cases, two errors are specified for each date in conformity with what was evolved during the recent Specialists' seminar on TL dating at Oxford during July 1978 : the first error is the standard error on the mean and the second error is the predicted accuracy of the TL age estimate.²³

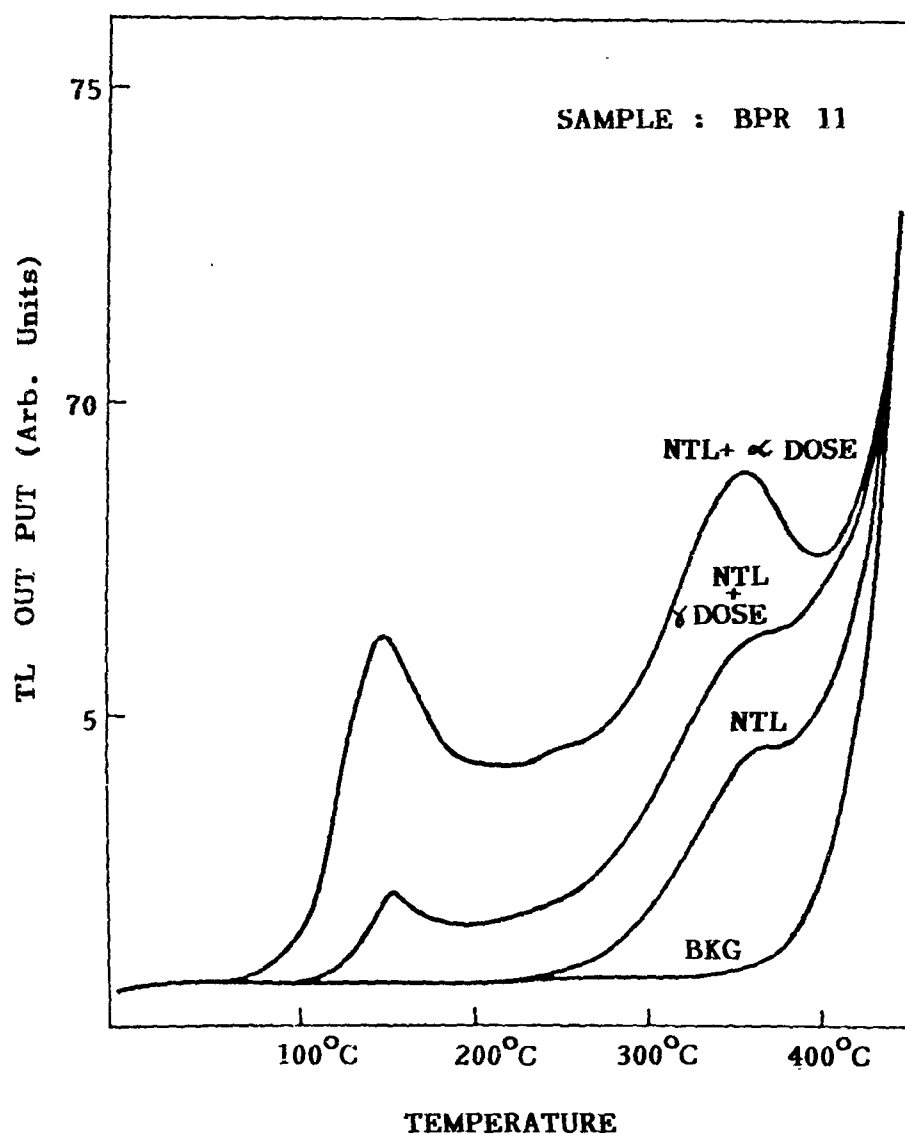
The predicted accuracy ranges between $\pm 9\%$ to $\pm 19\%$ in all these samples and such a high value stems from the generous allowance made for all possible values of water content in pottery and soil i.e. by putting $F = 0.5$ and $\delta F = \pm 0.5$. If this could be known actually from a knowledge of ground water tables of the site or if TLD measurements could be undertaken over at least a full year's duration to estimate the D component, then the accuracy would greatly improve to perhaps around ± 5 to $\pm 10\%$.

²³ M.J. Aitken and V. Mejdahl, Proc. of A Specialists' Seminar on TL dating (Oxford, 1978); M.J. Aitken, 'Radon loss evaluation by alpha counting', Paper 14 of the Proc. of Specialists TL Seminar held at Oxford.



EVALUATION OF ARCHAEOLOGICAL DOSE (EDr)
FOR POTTETRY SAMPLE

FIG. 44



TL GLOW CURVES FROM FINE GRAINS OF
A POT SHERD EXCAVATED AT BHAGAWANPURA.

FIG. 45

THERMOLUMINESCENCE DATING OF POTTERIES EXCAVATED AT BHAGWANPURA

(A value of $\delta F = \pm 0.1$ results in a $\pm 4\%$ error in typical TL age estimates).

6.1 TL ages of Bhagwanpura potteries : Among the 18 samples excavated, Grey wares occur only in the first six layers (upto a depth of about 1.3 m); the red wares are seen less frequently in these layers, but occur exclusively in all layers beyond 1.3 m depth. Fig. 46 shows the TL ages obtained for the grey-

TABLE 4
Radioactivity and saturation water uptake measurements on pottery and soil samples from Bhagwanpura site

Sample code	Pottery			Soil		
	C_{α}^P	$K_{\%}^P$	$W_{\%}^P$	C_{α}^S	$K_{\%}^S$	$W_{\%}^P$
	$\text{cm}^{-2}\text{hr}^{-1}$			$\text{cm}^{-2}\text{hr}^{-1}$		
BPR-1	5.05	2.60	11.6	3.15	2.00	30.00
-2	4.92	2.95	16.0	2.65	1.20	30.0
-3	5.06	2.95	15.0	1.57	3.03	30.0
-4	5.41	2.95	15.0	3.54	2.20	30.0
-5	4.70	1.92	15.0	2.11	1.72	30.0
-6	4.44	1.54	19.0	1.62	4.01	30.0
-7	4.98	3.67	15.0	2.55	2.21	29.0
-8*	4.81	3.08	16.0	3.00	2.19	30.0
-9	5.12	2.02	15.0	4.26	2.76	30.0
-10*	4.47	2.99	16.0	3.38	1.68	30.0
-11	4.69	2.15	15.0	4.03	3.16	29.0
-12*	3.92	1.63	14.0	3.84	2.01	30.0
-13	4.92	3.08	11.0	4.94 m	1.78	30.0
-14*	4.35	2.55	13.0	3.87	1.74	22.0
-15	4.37	3.34	18.0	3.38	1.74	30.0
-16*	4.50	1.21	12.0	4.15	1.82	30.0
-17*	4.23	0.90	16.0	4.63	1.97	33.0
-18	6.97	2.45	15.0	5.46	3.15	30.0

*Radon-loss possibility indicated (cf 5.4.5).

TABLE 5

Archaeological doses and the effective dose-rates estimated for the Bhagwanpura samples.

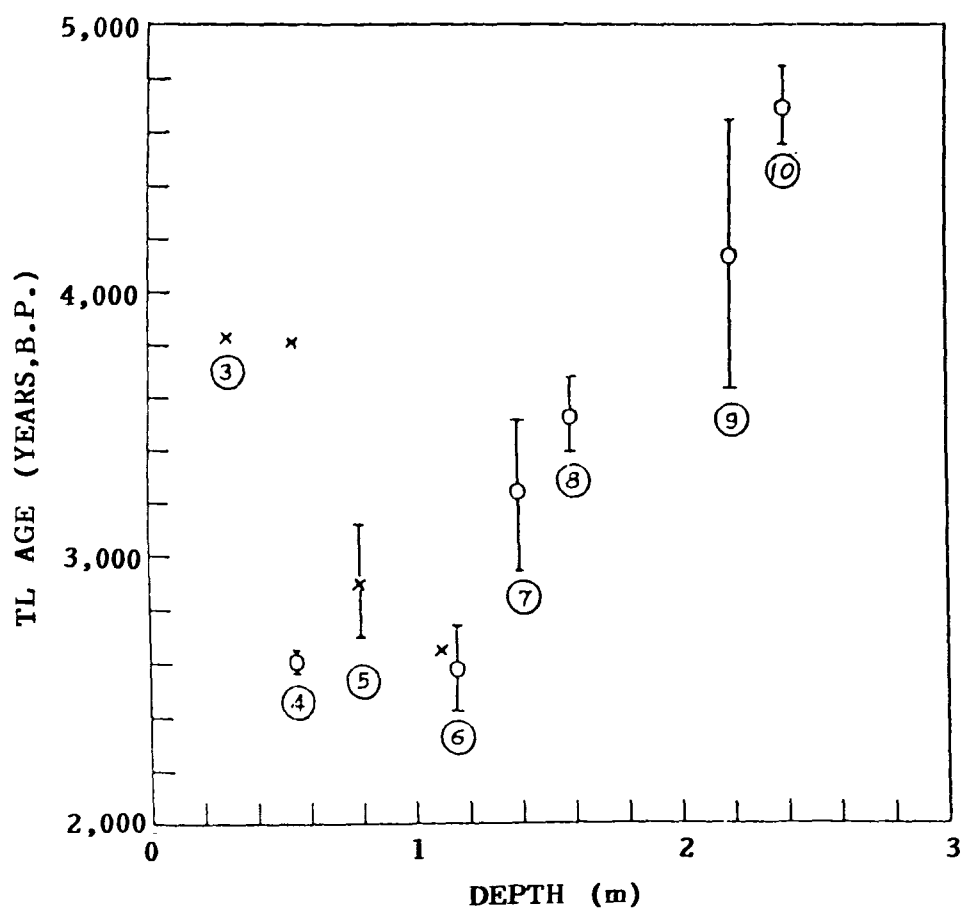
Sample code	Arch dose (rads)	k	Effective dose rates mrad Yr ⁻¹			
	ED _γ		D _α	D _β	D _γ	D _{cos}
BPR-1	22646 (FG)	0.10	2335.4	274.6	1016	20.0
-2	2125 (FG)	0.14	2199.1	285.8	76.8	12.5
-3	1610 (FG)	0.09	2276.9	290.4	86.2	12.5
-4	2072 (FG-a)	0.06	2434.4	297.8	113.3	15.0
	2950 (FG-b)	0.10				
-5	1739 (FG)	0.07	2114.9	333.5	93.1	15.0
-6	1369 (FG-a)	0.11	1945.4	185.2	104.4	15.0
	1900 (FG-b)	0.22				
-7	925 (FG)	0.11	2240.9	333.5	93.1	15.0
-8	740 (FG)	0.09	2149.9	291.6	101.7	12.5
-9	1629 (FG)	0.10	2303.9	233.7	138.3	12.5
-10	1034 (QI)	—	—	264.9	100.8	12.5
-11	1350 (FG)	0.08	2110.4	232.7	141.7	12.0
-12	2650 (FG)	0.13	1775.9	185.1	116.4	12.0
-13	2600 (FH)	0.13	2275.2	302.4	1359	12.0
	1272 (QI)	—	—	287.3	135.9	12.0
-14	2125 (FG)	0.10	1984.2	253.3	116.8	11.5
	1257 (QI)	—	—	240.7	116.8	11.5
-15	3400 (FG)	0.17	1927.4	295.2	101.7	11.0
	1423 (QI)	—	—	280.3	101.7	11.0
-16	1645 (QI)	—	—	171.2	119.6	10.5
-17	1746 (FG)	0.04	1890.7	144.3	130.5	10.0
	1258 (QI)	—	—	137.1	130.5	10.0
-18	1406 (QI)	—	—	284.3	170.6	10.0

FG = Fine grain method ; QI = Quartz inclusion method.

TABLE 6
TL ages estimated for the Bhagwanpura potteries

Sample Code	Depth of find	TL age year B.P.* (std error, predicted accuracy)
BPR-1	0.30	3830 (\pm - \pm 13%)
-2	0.80	311 (\pm - \pm 15%)
-3	0.80	2710 (\pm - \pm 15%)
-4	0.55	4038 (\pm 4% - \pm 13%)
-5	0.55	3814 (\pm - \pm 14%)
-6	0.55	2617 (\pm 1%, \pm 16%)
-7	0.55	1344 (\pm - \pm 15%)
-8	0.90	1235 (\pm - \pm 13%)
-9	1.10	2649 (\pm - \pm 15%)
-10	1.15	2742 (\pm - \pm 16%)
-11	1.18	2434 (\pm - \pm 17%)
-12	1.30	4868 (\pm - \pm 12%)
-13	1.40	3241 (\pm 9% - \pm 13%)
-14	1.60	3532 (\pm 4% - \pm 12%)
-15	2.10	4141 (\pm 12% - \pm 15%)
-16	2.25	5460 (\pm - \pm 15%)
-17	2.40	4696 (\pm 3% - \pm 17%)
-18	2.45	3024 (\pm - \pm 15%)

* Date of measurement : 1978



TL DATING RESULTS FOR POTTERIES EXCAVATED AT BHAGWANPURA. (X-GREY WARES ○-RED WARES) (THE BARS INDICATE THE SCATTER WHEN MORE THAN ONE DETERMINATION WAS MADE. LAYER NUMBERS ARE INDICATED WITHIN CIRCLES)

FIG. 46

of wares is quite evident: the GW ages decrease with depth in the region of 0.3 to 1.2 m during which the RW ages remains more or less the same corresponding to the lowest GW age obtained viz., about 2600 years, B.P.; the RW ages obtained viz., about 2600 years B.P.; the RW ages on the other hand, increase systematically with depth. (It should be pointed out here that only those RW age results for which more than one estimate could be made have been represented in Fig. 46). Perhaps the red wares belong to the old resident people native to the site and the grey wares to the latter settlement, the change over occurring somewhere between the sixth and seventh layers i.e. between 2600 to 3200 years ago. Bhagwanpura being an ancient site in the domain of the famous Indus Valley civilization, one is reminded of the overlap phase between the late Harappan and painted Grey ware cultures that is datable to *circa* 1500 B.C. to 1000 B.C. which is quite close to the TL ages mentioned above.²⁴

There remain some six samples (BPR-4, 7, 8, 12, 16, & 18) whose TL ages do not conform to the general trend presented in Fig. 6. It is left to the archaeologists either to reject them totally or partially depending upon individual sample considerations they may have.

7. CONCLUDING REMARKS

It is hoped that the TL ages presented in this report, are found to be useful by the archaeologists; in particular, it will be interesting if tangible explanations of historical significance could be ascribed to the distinct trends seen in the ages of the grey wares and red wares of Bhagwanpura. The TL age accuracies have been rather generously estimated to be between $\pm 9\%$ to $\pm 19\%$ in the present investigations; if reasonable values for the actual degree of wetness of the sites could be provided or alternatively, if TL dosimeters could be left buried at sites for one full year, the TL ages can be estimated with improved accuracies of the order $\pm 5\%$. It is wished that the details given in this report will be helpful to archaeological scientists and induce them to embark on TL dating techniques in their laboratories.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the fact that this project of TL dating was initiated in our laboratories by the retired Archaeologist, Dr. S. Paramasivan of Madras and sustained in the initial stages by a regular supply of authentic ancient potteries; we have also learnt from him a lot about careful choice of samples for purposeful dating. Dr. A.K. Ganguly, formerly the Director, Chemical Group, BARC was mainly responsible in getting us out of our inhibitions to take up archaeological applications of TL and but-for his constant encouragement and support, this project would not have taken up shape. Our sincere thanks and gratitude are due to Dr. B.K Thapar, Addl. Director General and Shri J.P. Joshi, Director (Excavations) of the Archaeological Survey of India, New Delhi for providing us with the pottery and soil samples. We were immensely benefitted by mutual exchange and inter-comparisons with the Research laboratory for Archaeology at Oxford and we are grateful to Dr. M.J. Aitken for the

same. We would like to thank Dr. C. M. Sunta, for his initiative and support in calibrations of the sources used in our investigations; in this regard, thanks are also due to Shri S. C. Misra and V. K. Bhargava of the Division of Radiological Protection for their offer of calibration facilities. We are also extremely thankful to Dr. S. Sadasivan and Shri M. Parameswaran for undertaking the potassium analysis of the samples by g spectrometry and AAs respectively. Lastly, but not the least, the assistance rendered by Sarvashri D.T. Khatri, M. David and A.R. Kamat in instrument maintenance, sample preparation and irradiation respectively, is gratefully acknowledged.

ANNEXURE-1

COLLECTION OF POTSDHERDS FOR THERMOLUMINESCENT DATING PRE-REQUISITES
AND GENERAL REMARKS

Pre-requisites

1. Only sherds that have been buried to a depth of 0.30 m or more should be collected; there should be fair knowledge that the context remained buried for more than three-fourths the archaeological period
2. The sherds should be at least 0.30 m away from any distinct boundary (e.g. edge of a pit, strata difference, walls, boulders).
3. Each sherd should be at least 5 mm thick and 25 mm across (bigger sherds are more preferable) and more than one sherd should be collected for each context.
4. If there are many fabric types (including surface glaze/decoration), each type should be covered by the collections.
5. Avoid unnecessary heating (in any case not more than boiling point of water) and unnecessary exposure to light (including sunlight);.
6. Do not expose the sherds to ultra-violet or infra-red lamps or to x-rays and gamma-rays.
7. No attempts need be made to surface clean and wash the sherds. The sherds along with the adjoining lumps of soils (about half a kilo—two tea cups full) should be put directly in a plastic bag within few minutes of removal from the context and tied up tightly.
8. Exposure of soil to sunlight or room light does not matter.
9. Notwithstanding conditions (1) & (2) above, the information about actual burial conditions should be supplied; (i) a sketch or photograph with markings of the locations from where sherds were taken; and (ii) samples of each type of large-sized material if any occurring within 0.30 m of the sherd.
10. Try to provide a rough estimate of the average water content of soil; if the context was in a water logged condition, it should be mentioned.

General remarks

11. The TL method requires the shreds to be destroyed during investigation.
12. The TL method gives the date at which the pot was made. If a sherd had been burnt at some later period, the TL age will not refer to the time of making the pottery.
13. The present accuracy of TL dating method is between ± 5 and $\pm 10\%$ of the age.
14. At the moment, the TL dating is recommended only for potsherds from fresh excavations where all the stipulated conditions (1–10) could be more or less satisfactorily met. Among museum samples, TL method can be used as a tool for authenticity test or cataloguing.
15. If sufficient prior notice could be given, it may be possible for a member of TL laboratory to participate in an excavation for stringent selection of contexts and materials.

ANNEXURE-II

ESTIMATES OF ERROR COMPONENTS IN TL DATING

The accuracy of the TL dating in the present investigations has been predicted on the same lines recommended by Aitken²⁵. The two dosimetry options actually adopted in our work are classified, for error assessment purposes, as follows :

A. No use of TLD; radioactive analysis only.

B. Gamma dose-rate by TLD.

Besides, the following are also defined for the convenience of handling the equations :

$$f_{\alpha} = \frac{k \cdot \dot{D}_{\alpha}^P}{\dot{D}}; f_{\beta, Th, U} = \frac{\dot{D}_{\beta, Th, U}^P}{\dot{D}}; f_{\gamma, Th, U} = \frac{\dot{D}_{\gamma, Th, U}}{\dot{D}}$$

$$f_{B \cdot K} = \frac{\dot{D}_{\beta}^P}{\dot{D}}; f_{\gamma, K} = \frac{\dot{D}_{\gamma, K}^S}{\dot{D}}; f_{\beta} = f_{\beta, Th, U} + f_{\beta, K};$$

$$f_{\gamma} = f_{\gamma, Th, U} + f_{\gamma, K} \text{ and } \dot{D} = k \dot{D}_{\alpha} + \dot{D}_{\beta} + \dot{D}_{\alpha} + \dot{D}_{\gamma} \dot{D}_{Cos}$$

A. Random errors

1. The percent error term due to random errors in the evaluation of Q, I & K (assumed $\pm 5\%$ in our case) is given by

$$(\sigma_1)_A^2 = (\sigma_1)_B^2 = 25 \left[1 + f_{\alpha}^2 + (1 - f_{\alpha})^2 \right]$$

2. The percent error on the TL age estimate due to random errors in alpha counts and potassium analysis (assumed $\pm 5\%$ in our case) and in TLD evaluation of gamma dose rate (assumed $\pm 2\%$ in our case) can be written as ;

$$(\sigma_2)_A^2 = 25 \left[\left(f_{\alpha} + f_{\beta, Th, U} \right)^2 f_{\beta \cdot K}^2 + f_{\gamma, Th, U}^2 + f_{\gamma \cdot K}^2 \right]$$

$$(\sigma_1)_B^2 = 25 \left[\left(f_{\alpha} + f_{\beta, Th, U} \right)^2 + f_{\beta \cdot K}^2 \right] + 4f_{\gamma}^2$$

B. Systematic errors

3. The net percent error on the TL age estimate due to uncertainties in the calibrations of alpha and gamma sources, alpha counter, potassium analyser and the TLD measurement of gamma dose rate (assumed $\pm 5\%$ for each in our case) can be given as ;

$$(\sigma_3)_A^2 = 25 \left[f_\alpha^2 + (f_\alpha)^2 + (f_\alpha + f_{\beta, Th, U} + f_{\gamma, Th, U})^2 + (f_{\beta, K} + f_{\gamma, K})^2 + (f_{\beta, K} + f_{\gamma, K})^2 \right]$$

$$(\sigma_3)_B^2 = \left[f_\alpha^2 + (1 - f_\alpha - f_\beta)^2 + (f_\alpha + f_{\beta, Th, U})^2 + f_{\beta, K}^2 + f_{\gamma}^2 \right]$$

4. The uncertainties in Th/u ratio (assumed between 1.2 and 10.5) give rise to a percent error term in the TL age estimate as given by :

$$(\sigma_4)_A^2 = 3f_\alpha^2 + 85f_{\beta, Th, U}^2 + 128f_{\gamma, Th, U}^2$$

$$(\sigma_4)_B^2 = 3f_\alpha^2 + 85f_{\beta, Th, U}^2$$

5. The percent error term arising out of uncertainties in water uptake (assumed $\frac{1}{2} + \frac{1}{2}$ of saturation) is given by

$$(\sigma_5)_A^2 = (\sigma_5)_B^2 = 0.25 \left[W^P (1.5f_\alpha + 1.25f_\beta) + 1.15f_\gamma W \right]$$

Note : If TLD measurements of the gamma dose rate could be carried out at site over one full year and if it can be fairly assured that the same seasonal variations existed over the archaeological period, then the second term in the above equation can be neglected.

6. Discrepancy between TLD evaluation of gamma dose rate and prediction from radioactive analysis (assumed $\pm 10\%$ vide sec. 5.4.8) gives rise to an error term

$$(\sigma_6)_A^2 = (\sigma_6)_B^2 = 100f_{\gamma, Th, U}^2$$

7. If α_1 and α_2 refer to the count rates of unsealed and sealed samples, assuming a $\pm 25\%$ uncertainty in the degree of radon escape in the actual burial conditions, the resulting error terms is approximately given by

$$(\sigma_7)_A^2 = (\sigma_7)_B^2 = 10^4 \left\{ \left(\frac{\alpha_2^P - \alpha_1^P}{4\alpha_1^P} \right)^2 (f_\alpha + f_{\beta, Th, U})^2 + \left(\frac{\alpha_2^S - \alpha_1^S}{2\alpha_1^S} \right)^2 f_{\gamma, Th, U} \right\}$$

C. Best estimate of the TL age and standard and predicted errors

If more than one age estimate is made for the same context, the random and systematic errors are individually calculated for each age estimate A_i as :

$$(\sigma_i)_\gamma^2 = \sigma_1^2 + \sigma_2^2$$

$$(\sigma_i)_2^2 = \sigma_3^2 + \sigma_4^2 + \dots + \sigma_7^2$$

$$\sigma_i^2 = (\sigma_i)_\gamma^2 + (\sigma_i)_2^2$$

$$\text{Best Age estimate : } \frac{\sum A_i / \sigma_i^2}{\sum 1 / \sigma_i^2} \text{ years}$$

$$\text{Standard error on the mean } \sigma_A = \left\{ \frac{\sum (i - \bar{A})^2}{n(n-1)} \right\}^{1/2} \text{ years}$$

$$\text{Predicted error } \sigma_B = (\sigma_\gamma^2 + \sigma_s^2)^{1/2} \%$$

$$\text{where } 1 / \sigma_\gamma^2 = \sum 1 / (\sigma_i)_\gamma^2$$

$$\text{and } \sigma_s = \frac{\sum (\sigma_i)_s / \sigma_i^2}{\sum 1 / \sigma_i^2}$$

CHAPTER XV

SCIENTIFIC INVESTIGATION OF POTTERY

B.N. Tandon

CHAPTER XV

SCIENTIFIC INVESTIGATION OF POTTERY

In archaeology, an ancient culture is identified by a characteristic pottery and hence it is a very useful method. Scientific analysis of pottery further determines the degree of the advancement of technology in potter's craft of a specific period besides revealing the ingredients of clay and the source material. Keeping this aspect in view, twelve samples of pottery from Bhagwanpura were put to scientific investigation. The representative samples were subjected to the following analytical procedures :—

1. *Visual examination (colour, grains and other significant features)*: An important question very often asked whether a pottery is imported to the region and this naturally leads to speculation about source materials. In the present case, most of the sherds are made of fine grained clay material and show the good artistic work of the potter. The pottery on the outer side has been finished very well. The wheel movement appears to be well controlled for making thin or thick pottery. In many cases the mica particles are clearly visible. Most of the sherds are very compact, homogeneous and the grains very well placed as could be seen in the section.

2. *Study of the section (uniformity or heterogeneity etc.)*

3. *Analysis of the material (nature of the clay used).*

4. *Surface studies (any depositions etc.).*

5. *Studies of the condition preparation.*

6. *Firing temperature (by TGTDA or by porosity measurements.*

7. *Physical property determination (porosity, density, permeability etc.)*

(1) The pottery in general of Bhagwanpura consists of light red to dark with an intermediate dirty brick red, in some cases painted lines of black colour were also seen.

(2) Another group consists of grey or ash colour from light to dark grey (main body completely baked into one coloured/clay).

(3) Black coloured one with incised marks without any regular pattern, the whole matrix shows black colour.

COLOUR SCHEME (PLS. LXII-LXIII)

<i>S. No.</i>	<i>Sample No.</i>	<i>Details</i>
1.	1	Ash coloured grey.
2.	2	Ash coloured grey.
3.	3	Brick-red slightly-yellowish-mica particles, both sides uniform.
4.	4	Brick-red
5.	5	Brick red-dull, thick body which is generally uniform
6.	6	Dark-red-over ash coloured pottery (red is uniform on both sides)

7.	7	Ash coloured.
8.	8	Brick red.
9.	9	Dirty red.
10.	10	Light brick.
11.	11	Red-colour.
12.	12	Black colour.

In order to evaluate the results, it was decided to have the pottery-chemically analysed. The results are tabulated below :—

CHEMICAL COMPOSITION

<i>Sample No.</i>	<i>% of moisture</i>	<i>Loss of ignition</i>	<i>% of Silica</i>	<i>% of R_2O_3</i>	<i>% of CaO</i>	<i>% of MgO</i>	<i>Remarks</i>
1.	.23	1.20	58.2	30.80	4.40	2.83	
2.	.20	1.26	61.00	30.01	4.02	1.74	
3.	.30	1.25	61.62	30.84	2.25	1.78	
4.	.16	0.80	63.80	28.16	4.25	1.16	
5.	1.16	.92	61.60	30.25	1.85	2.32	
6.	.38	1.37	60.25	28.61	6.00	2.36	
7.	.7	1.60	61.28	29.56	5.05	3.40	
8.	.6	1.58	66.16	21.24	4.21	2.53	
9.	.6	1.66	65.28	28.88	3.06	1.90	
10.	.35	1.40	61.10	31.08	3.35	1.18	
11.	.045	2.00	63.40	25.12	3.60	2.34	
12.	.43	8.45	55.20	26.50	4.80	2.91	

The hygroscopic range of all potteries is from 0.16 (4) to 1.16 (5) and loss on ignition is more or less the same, representing the value for organic matter and combined water except in No. (12), where it appears to have more carbon or organic material.

The silica content indicates that the potter has used more or less similar source for his pottery making, which ranges 55.20 to 66.16% thus supporting the thinking of Dr. Wallis that rocks are reasonably homogenous within the same formation and that a similar source material has been used may be a slightly away.

R_2O_3 is ranging from 21.24% to 31.08% indicating the high content of Fe_2O_3 & Al_2O_3 , (the more Al_2O_3 , the more plasticity is the rule), while the iron contents indicate colour. The colour produced by iron is of three types i.e. yellow, red and blue. This is due to colloidal dispersion. Calcium to the tune of 1.85% to 6% indicates the characteristic of the clay to resist shrinkage and facilitates drying; the

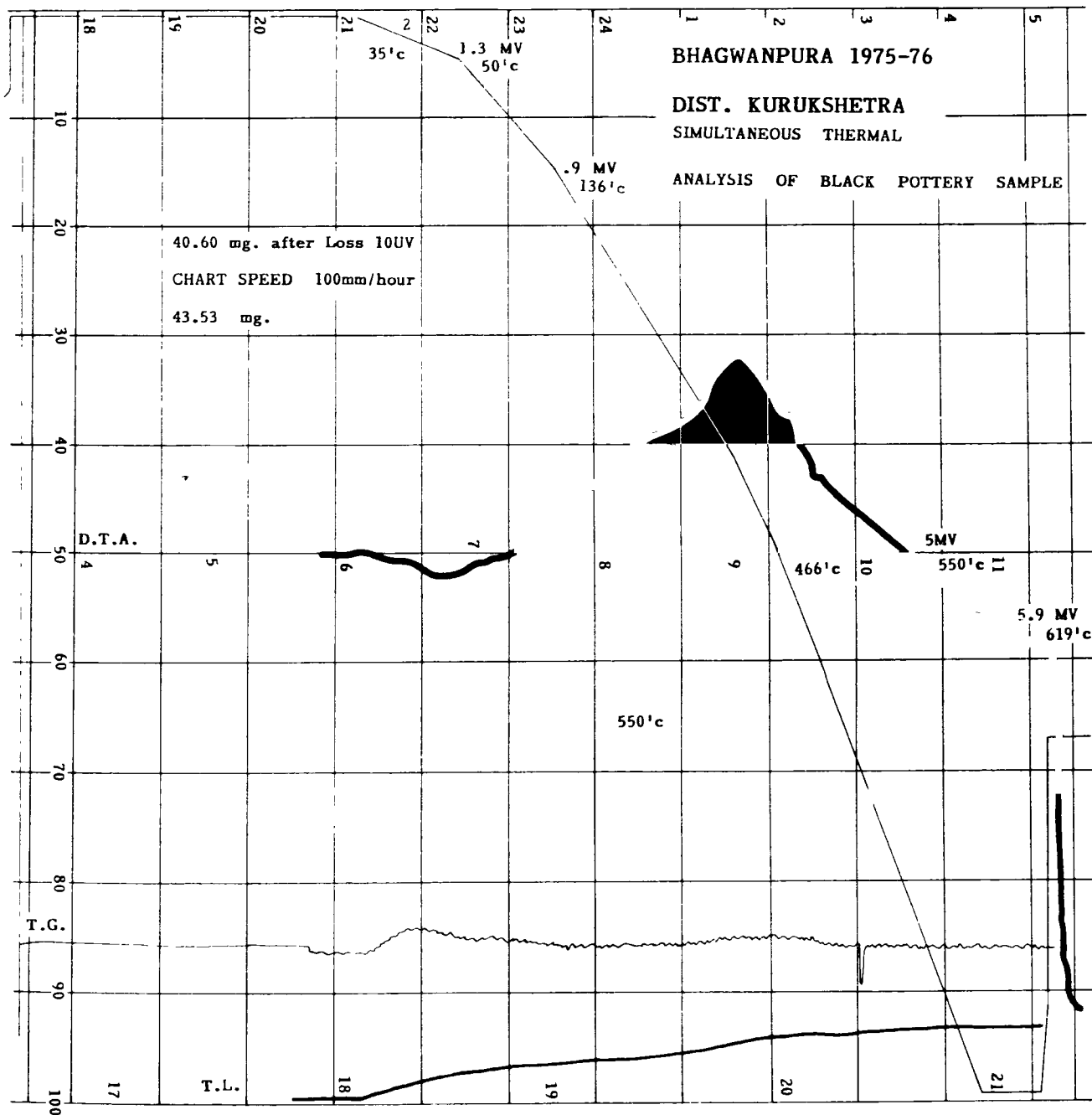


FIG. 47: Graph showing analysis of Black pottery sample

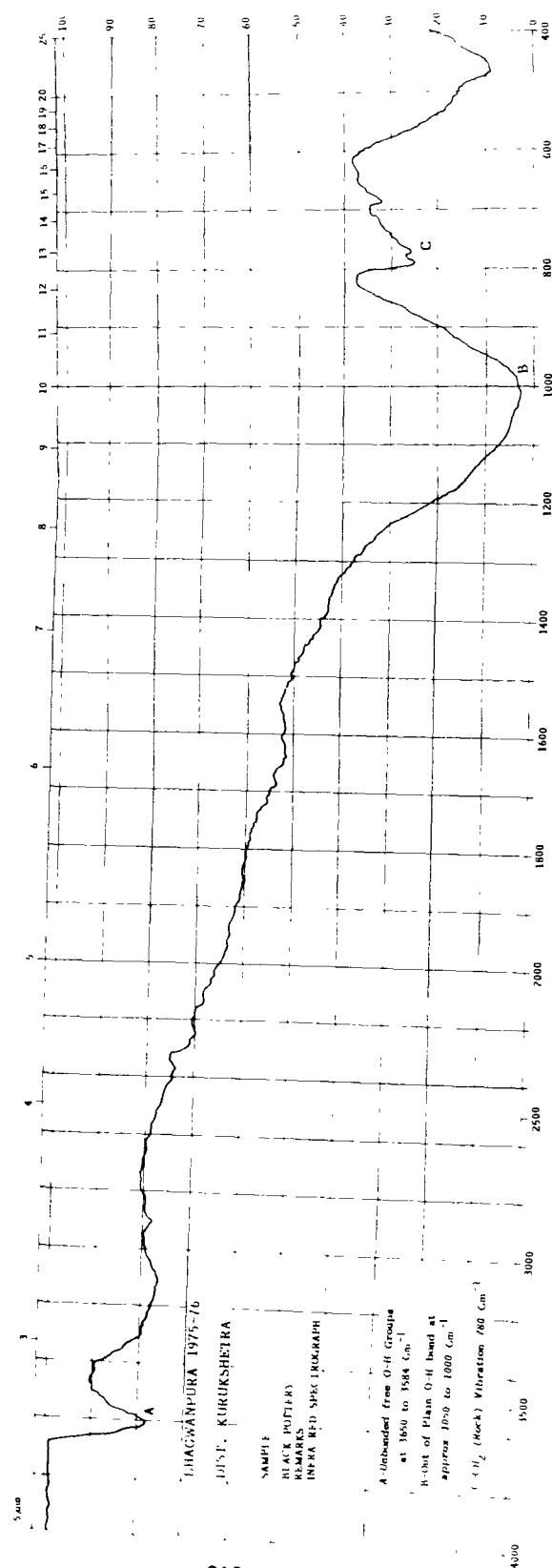


Fig. 48: Graph showing Black pottery Infra-red spectrograph

values are uniform for several samples e.g., sample nos. 1,4,2,10 while in 5 it is less, in 6 and 7 it is more. Thus, a careful look at the later shows that all these sherds have been made from almost the same clay from one place. It appears to be natural clay in all cases of sherds under examination. Pottery making involves four stages i.e. (1) preparation of clay for making pots which is mostly depending upon the nature of local clay, used by tradition. (2) shaping (3) drying and (4) firing.

A majority of the sherds are of the fine grained variety with very smooth outer surface which has been done by wet expert hand. A coarser variety has also been noted. This operation improved the appearance and also makes the material less permeable. The hygroscopic water in all the cases is quite at the same level (i.e. water of plasticity). The clay has been thoroughly grinded to increase its plasticity. Drying draws the clay particles closer.

In the main body there does not seem to be any deliberate intervention as the body is free of air cavities. The colour is uniform of the material which has been fired through out, thus our conclusion is that only one type of source material has been used. The clay consists of hydrated aluminium-silicate of variable composition, with various impurities. Pure clays exists only in theory and having a typical ingredient as following :—

Silica	60%
Alumina	30%
Iron	7%
Lime	2%

A comparison between pure clay and clay from sherds showed that the alumina is about $\frac{1}{2}$ the total R_2O_3 as determined in nearly all the varieties meaning thereby that clay used in the sherd is of moderately plastic variety and not so easily workable as with high % of Alumina. The presence of Mg to the tune of 1.16 to 3.40% indicate that these belonged to the variety of burnt clays. The proportion of silica is more in black than in other variety, however, the source is more or less the same. In pottery the ratio of Fe_2O_3 : CaO is also important. If iron is present more than 5% it would be red after firing, if it has calcium to a larger extent, it becomes yellowish, but due to Fe_2O_3 the colour is masked to red. The pottery under examination was found to be wheel made. For colouring the surface here and there, red haematite has also been identified.

PHYSICAL PROPERTIES

S.No.	Sample No.	Porosity	Density	Thickness	
				Max.	Min.
1.	1	16.52	2.26	4.0 mm	3.8 mm
2.	2	22.60	2.20	6.00 mm	4.00 mm
3.	3	22.24	2.02	5.5 mm	5.00 mm
4.	4	22.90	2.17	8.00 mm	7.7 mm
5.	5	24.39	2.13	7.00 mm	6.00 mm
6.	6	16.08	2.23	6.5 mm	5.00 mm

<i>S.No.</i>	<i>Sample No.</i>	<i>Porosity</i>	<i>Density</i>	<i>Thickness</i>	
7.	7	16.60	2.12	3.7 mm	3.00 mm
8.	8	26.08	2.13	8.10 mm	7.70 mm
9.	9	26.00	1.96	7.15 mm	7.00 mm
10.	10	19.60	2.20	8.2 mm	7.9 mm
11.	11	17.00	2.18	6.00 mm	5.8 mm
12.	12	12.30	2.35	4.0 mm	3.4 mm

PERMEABILITY (PLS. LXIV-LXVI)

44.6%

33.3%

The thickness of the pottery indicated that there is little variation at different points with the exception of 2, probably the potters were expert in their job.

The importance of porosity determination has been very ably brought out by Matson and he has suggested further study of different potteries. As a matter of fact the type clay, the size of the particles, duration and range of firing are some of the other important steps to determine the porosity cum firing temperature ratio.

In general, when clays are heated to a high temperature they under go vast chemical changes resulting in gaining of some desirable characteristics as the atoms move from their fixed positions to a more favourable position. Heating the clay to 110°C results in loss of hygroscopic moisture while at 450-500°C the water of constitution or combined water is lost. Further heating to 800°C result in the internal disturbance and breakdown of the clay structure starts. In the present case, clay structure is very compact indicating the minerals being angular and sub-angular rather rounded ones thus good interlocking has taken place.

BLACK POTTERY

An analysis revealed that the most of the iron present is in Fe⁰ form i.e. black ferrous oxide (Magnetite or siderite) which accounts for the colour in reduced atmosphere, say with coal or wood or in contact with a reducing material. This pottery is extremely fine grained with a homogeneous body, I.R. spectra of the black paint having a similar chemical composition as the black pottery. The porosity measurement of the sherd indicates voids to the tune of 12.3% inspite of the presence of carbon particles indicated by readily oxidiable material which can interlock the void space at lower temperature of 100-250°C, thus confirming that the temperature of firing might neither be very low and nor very high as

SCIENTIFIC INVESTIGATIONS OF POTTERY FROM BHAGWANPURA

in the later case fusion of minerals to block the voids would have occurred and thus a decrease in porosity would result. The organic content of black pottery indicates the presence of 8.45% of oxidizable material which is quite high, thus indicating the firing has been done at a lower temperature in reduced atmosphere for a long time or otherwise in a higher temperature the organic content would have been much less. Porosity of this magnitude would result only at a temperature of 300° to 500°C.

INFORMATION OBTAINED BY TG/TDA-CURVE-ANALYSIS

The first peak which is endothermic and small but significant shows that the loss of water molecules occur at 35°C to 135°C which are entrapped as absorbed water and hydrated water in the structure.

The second peak is exothermic occurring at 4.1 mv i.e. at 466°C, thus indicating that the H₂O loss starts from 135°C and almost complete at 619°C, thus the probable firing range is in between 300° to 600°C.

I.R. SPECTRUM OF BLACK POTTERY

The broad but small band at 100 cm⁻¹ corresponds to Aliphatic Si-O-stretching.

The sharp peak at 3600 cm⁻¹ correspond to free group that is free H₂O and is not intermolecular bond.

The medium peak appears at 800 cm⁻¹ corresponds to some organic compounds which is probably organic carbon containing material. The medium peak at 450 cm⁻¹ corresponds to the presence of some aromatic compound (figs. 47-48).

RED POTTERY

It varies from slightly brick yellow to red, the body appears homogenous without human interventions, in some cases the pottery has paintings over it with black which has a similar chemical composition as the black pottery as revealed through I.R. In most cases it is fine grained while in a few cases it is not so fine, but the body is quite compact. A look at the analytical data reveals that the colour of the pottery is on account on oxides of iron which are present to the tune of 25.12 (R₂O₃) i.e. Fe₂O₃ and Al₂O₃.

The silica contents ranging from 55.20% to 66% is quite near the % composition of the usual representative clay i.e. 60%, the moisture in both the red, black are nearly the same. The calcium is present to the tune of 3.6% and is significant as an increase beyond 5% would affect the red colour to become yellow, Magnesium oxide is present as a minor constituent i.e. 2.34%. It has muscovite and quartz in addition.

Porosity measurements indicate porosity to be of the order of 17%, it means that the firing has been done beyond 900°C where porosity is much higher, but fusion of mineral reduces it. Fine grained particles have very little void in between the particles and therefore, there is lower porosity, while in case of coarser ones, there is more space between these, hence more porosity.

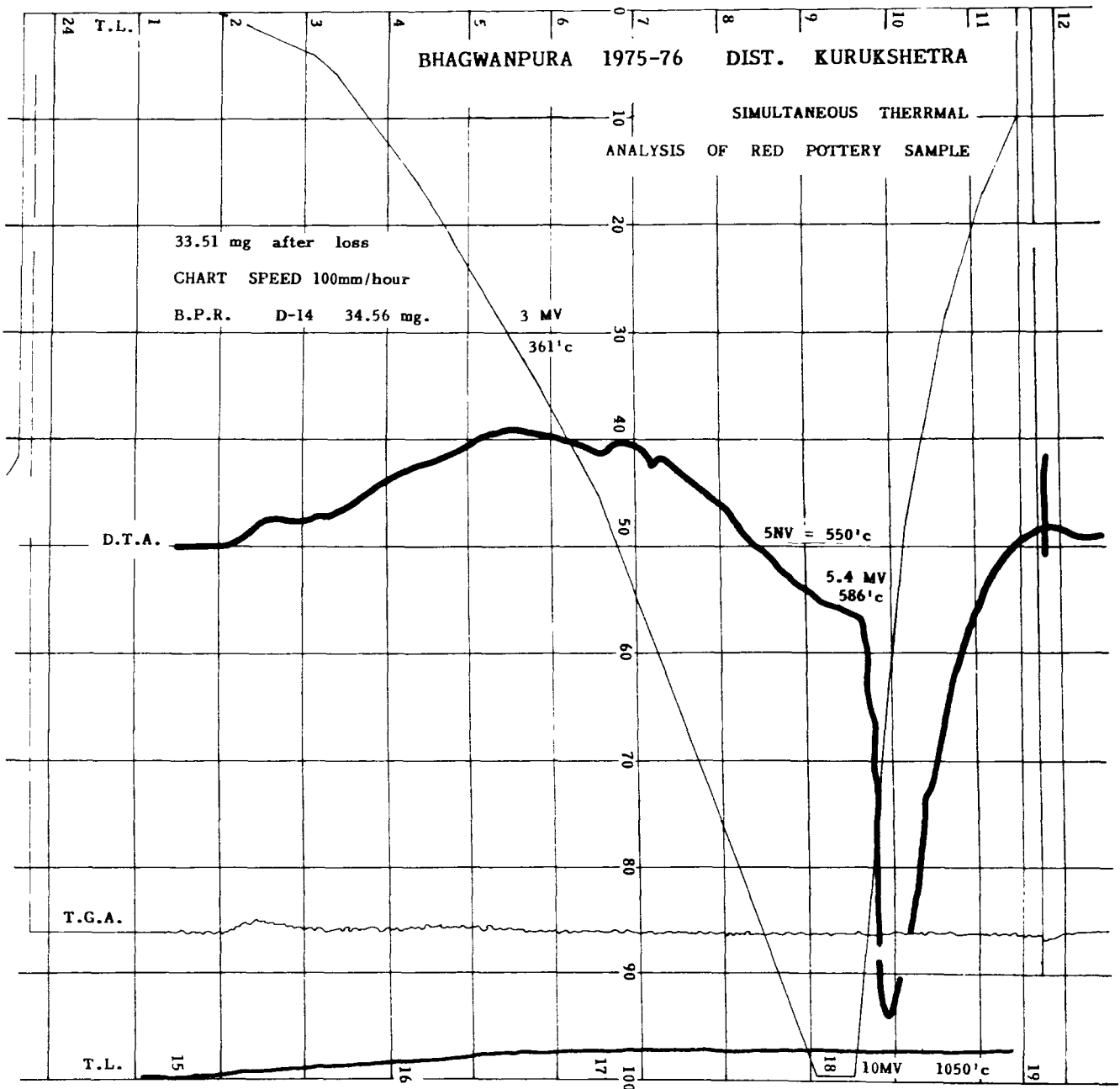


Fig. 49 : Graph showing analysis of Red pottery sample

SCIENTIFIC INVESTIGATIONS OF POTTERY FROM BHAGWANPURA

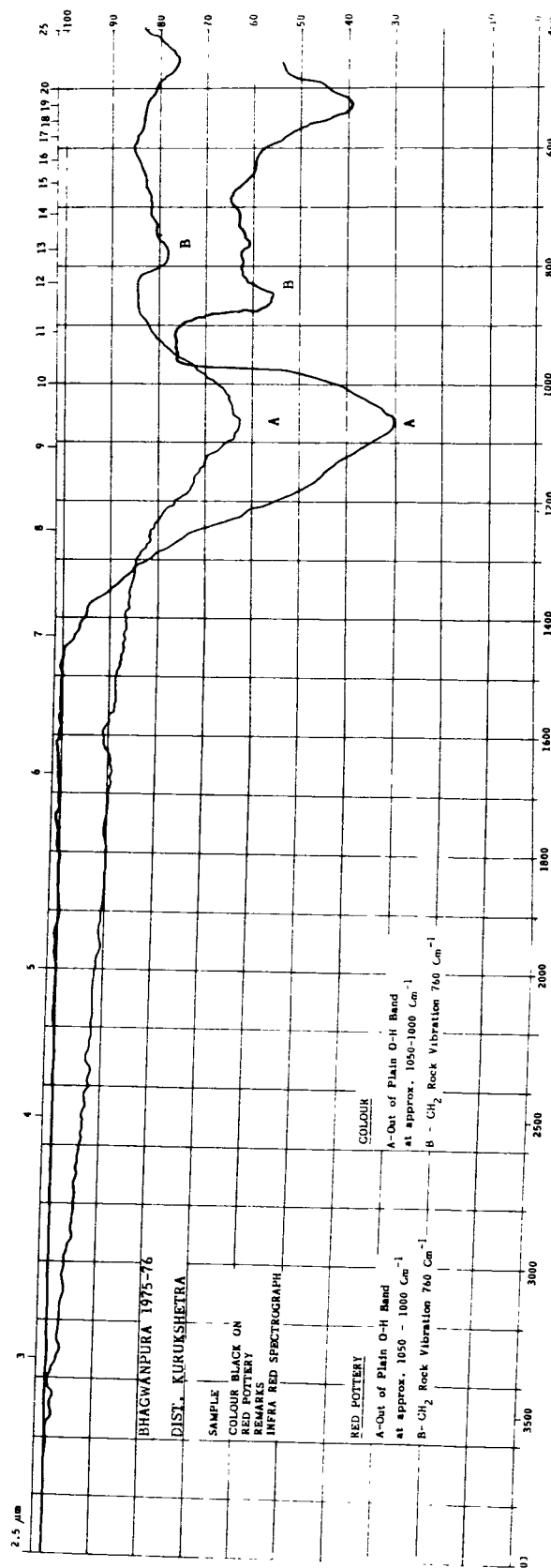


Fig. 50 : Graph showing Infra-red pottery sample

INFORMATION OBTAINED BY TG/TDA

The broad exothermic peak with negligible height is not of any importance. It starts from 30°C and extend upto 586°C. The extension of peak can be assigned for some impurities which are inherent in the clays, at the same time loss indicated is very small with no significant peak, thereby indicating that the temperature of firing must be nearer or higher than 1050°C (figs. 49-50).

I.R. SPECTRA OF BLACK STRIPES ON RED POTTERY

Similar material has been used for black pottery and the black stripe over the red pottery. However, the concentration varies, more in stripes and less in pottery. This may be organic carbon suggesting further that black stripe might have been derived by sedimentation/levigation.

CONCLUSIONS DRAWN FROM I.R. OF BLACK PAINT
ON RED POTTERY

The first broad peak which arises between 1000 cm^{-1} to 1100 cm^{-1} corresponds to Aliphatic-SiO-stretching. The IInd peak at 850°C correspond to some silicon compound present in the pottery i.e., SiF_4 , SiO_2 etc.

GREY POTTERY

In between black and red-ware, there is another one known as grey-ware, sample nos.: 1, 2, 7 are representatives of that. This pottery has hygroscopic moisture to the range of .20 to .7% with loss in ignition from 1.20 to 1.60 thereby meaning that both the water of constitution and organic material which has been used to colour has evaporated to some extent. Among this group, some variation has been noted i.e. sample Nos. 1-7. No. 2 has a uniform grey colour in the outer side and main body. The thickness of grey coloured ones indicate the fineness as well as expertise in making. All these three samples are wheel made and not so well made as No.7 in respect of fineness. The porosity of sample No. 1, 6 and 7 are more or less the same while sample No. 2 is 22-60 showing that it has better grains and uniformly baked at a slight high temperature in between black to red. The grey colour is produced by organic carbon made into a slip produced under reduced condition away from the centre of kiln but the temperature is higher than the black one i.e. Sample No.12, since some evaporation of organic carbon has occurred, the firing temperature would be between 650°C-750°C.

Acknowledgement

My grateful thanks are to Sarvasri P.K. Nagta, Y K. Kanotra, R. Chaturvedi, Sunil Kapoor and Mridul Pande for their valuable assistance in the analysis of the material.

CHAPTER XVI

ANALYSIS OF GLASS FROM BHAGWANPURA

B. N. Tandon

CHAPTER XVI

ANALYSIS OF GLASS FROM BHAGWANPURA

Several glass bangle pieces and two glass beads have been found from Sub-period IB levels of Bhagwanpura which has an overlap of late Harappa culture with Painted Grey Ware culture. The availability of glass from this archaeological horizon which is datable to *circa* 1400 B.C. to 1000 B.C. on the basis of TL dates is of far reaching importance as it pushes back the antiquity of glass in India to *circa* 1400 B.C.¹.

The origin of glass is shrouded in mystery but it is certain that glass making is a very ancient craft. Perhaps the earliest examples of the glass are from pre-dynastic sites in Egypt in the form of beads and dates back to *circa* 3500 B.C. to 2500 B.C.². Glass making techniques spread gradually from Egypt to other areas. It is also believed that Mesopotamia was also a centre of glass industry as beads of glass have been found at Ur (2100 B.C.)³. Glass making was done at the famous site of Tel-el-Amerna which have also yielded tablets mentioning Vedic gods⁴. However, glass blow pipe was made in *circa* 300 B.C. in Babylon⁵. Due to the close connection between glaze and glass, it is possible that earlier glass was not given a separate identity⁶. Pliny considered Syrian towns of Tyse and Sidon as principle glass producing centres. Chinese glass originated in *circa* 550 B.C. which contained barium and lead oxide⁷.

In India, the earliest literary references to *Kacha* (glass) occurs in *Satpatha Brahmana* where there are references to women wearing glass beads (13.2.68) and to the wearing or threading of one hundred and one beads of glass. *Taittiriya Brahmana* (3.7.4.4) also refers to "wearing of glass (beads)". *Baudhayana* and *Manava Sruta Sutra* also refer to glass⁸.

Pliny (first century A.D.) stated that Indians were knowing the art of glass-making and had to colour it by the addition of metallic-salts. Kisa however questioned it. In India, *Kacha* had been reported in the early literature but nothing is described about the technique of its manufacture.

¹ For dating of Sub-period IB at Bhagwanpura see p. 20, *ante.*; Peter Francis, Jr. 'A Note', *Journal of Glass Studies*, Vol. 26, 1984, pp. 154-153.

² Lucas, *Ancient Egyptian Materials and Industries* (London, 1948), p. 207.

³ H.B. Francfort, *Iraq Excavations*, 1933-35, p. 55. A cylindrical light blue glass of excellent quality has been reported from Tel Asmar, north-west of Baghdad.

⁴ "But the most remarkable finds are those from the city of Tel-el-Amerna where extensive remains of glass house and glass in various stages of manufacture have been recorded" (1500 B.C. to 900 B.C.). Turner (1954), Petrie (1929).

R.N. Singh, *Ancient Indian Glasses, Archaeology and Technology* (Delhi, 1989), p. 18.

R.C. Majumdar and A.D. Pusalkar, *Vedic Age* (London, 1957), p. 204.

⁵ Giovanni Mariacher, *Glass from Antiquity of Renaissance* (London, 1970), p. 17

⁶ Susan Frank, *Glass and Archaeology* (London, 1982), p. 17.

⁷ G.W. More *The Properties of Glass* (New York, 1938), p. 17.

⁸ S.B. Deo, 'Early Indian Glass: Antiquity and Archaeology', in *Archaeometry of Glass*, (ed) M.C. Bhardwaj, pp. 76-77.

Glass is reported from early historical and historical periods from : Ahichchhatra, Alamgirpur, Atranjikhhera, Arikamedu, Brahmagiri, Chandraketugarh, Hastinapura, Kausambi, Kondapur, Kopia, Kurukshetra, Maheshwar, Maski, Nagda, Nalanda, Nasik, Nevasa, Pataliputra, Ropar, Taxila, Ujjain, etc.⁹

The glass pieces discovered at Bhagwanpura are translucent to semi-transparent and the colours used are blue, black, green. However, due to few samples available for analysis, only quantitative analysis has been done in the case of black glass, while the 3 others were identified in respect of their colouring material.

BLACK GLASS

A scientific examination revealed that the glass has the following density. It has black colour and breaks in conchoidal fashion-showing iridescence. The chemical analysis is tabulated as under. Glass consists of materials made by combining natural, occurring inorganic materials and heating to fusion so as to make them in a consolidated mass. Four samples have been examined. No. 7 and 8 are quite similar and probably part of the same, hence one of them (No.7) was analysed, while the others were subjected to qualitative testing in respect of their colouring matter. The following results are obtained by Energy Dispersive X-ray Fluorescence Analysis.

	Sample	Colour	Element Present		
			Cu	Zn	Fe
No.1	5/78	Blue		X	In this Ti was present
No.2	6/78	Blue		X	
No.3	7/78	Black	X		In traces
No.4	8/78	Black	X		

The black sample No.7 from Bhagwanpura was further subjected to chemical analysis to determine the constituents and technique.

⁹ Robert H. Brill, 'Chemical Analysis of some early Indian Glass' in M.C. Bharadwaj (ed.), *Archaeometry of Glass* (Calcutta, 1987), pp. 1-36; Abidgani A. Abdurazakor, 'Indian and Central Asian connection—A study based on chemical analysis of glasses' in M.C. Bhardwaj, *Archaeometry of Glass* (Calcutta, 1987), pp. 38-43; B.B. Lal, 'Glass Technology in Early India' in M.C. Bhardwaj (ed), *Archaeometry of Glass*, pp. 44-56; M.G. Dixit, *History of Indian Glass* (Bombay, 1969), p. 52, 162; C.S.I.R. *Chemical Study of some Indian Archaeological Antiquities*, Monograph, No. 10.

ANALYSIS OF GLASS FROM BHAGWANPURA

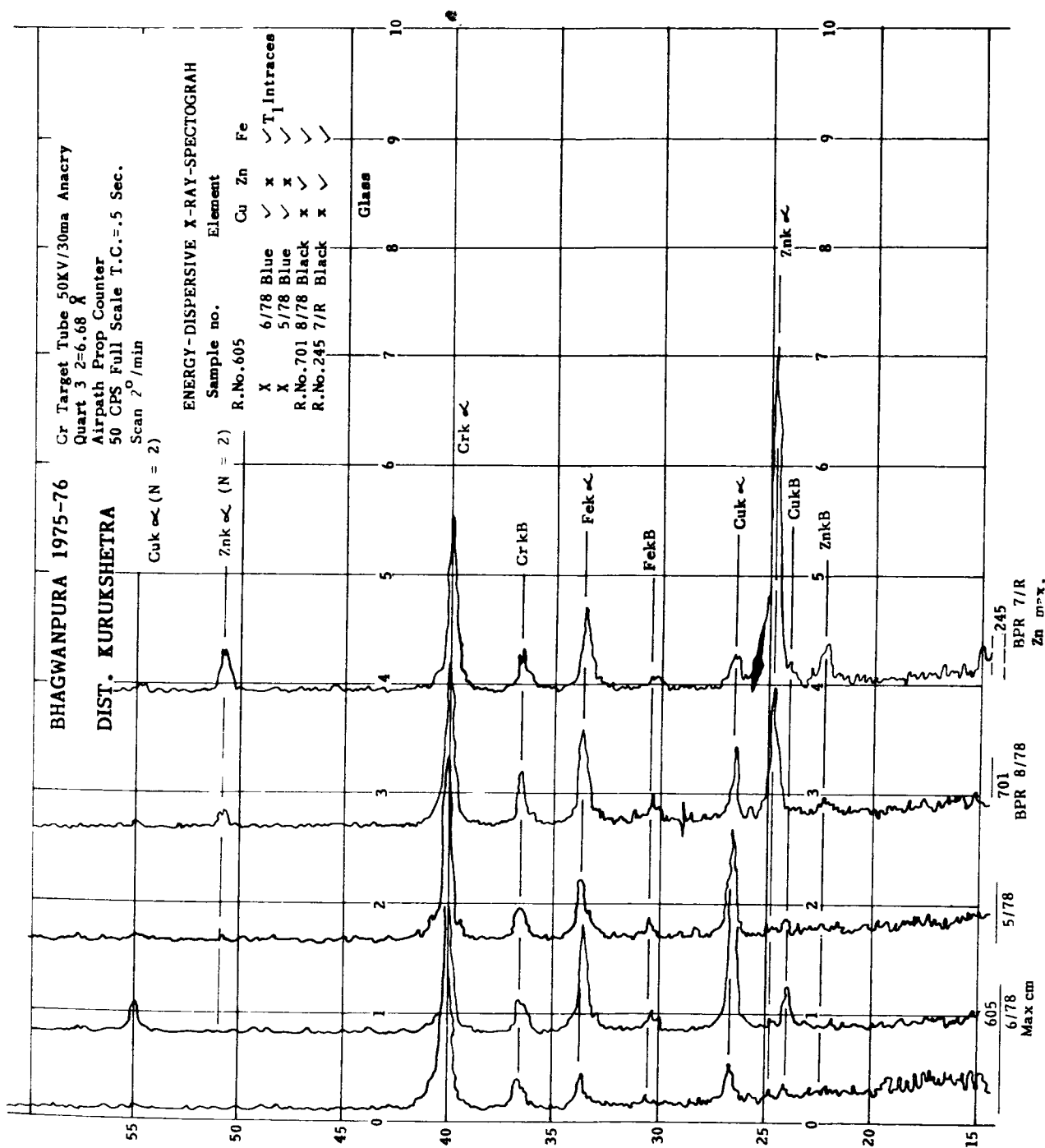


FIG. 51 : Graph showing Energy Dispersive X-ray Spectrograph of glass samples

<i>Sample No.</i>	<i>Density</i>	<i>Moisture</i>	<i>Loss on ignition</i>	<i>SiO₂</i>	<i>R₂O₃</i>	<i>CaO</i>	<i>MgO</i>	<i>Alkalies</i>
7	2.4	0.00	12.6	57.56	9.43	4.13	1.56	by difference

From the above data it is clear that the high % of loss in ignition is due to organic depositions which have come as a result of long burial in the soil. SiO₂ is 57.56% and the R₂O₃ is 9.43% thus amounting to 66.90% constituting acidic group. The alkalies are about 14.72% in comparison with lime and magnesia which are 5.69% (fig. 51).

The R₂O₃ constitutes about 9.43% which is quite a big proportion and is accounting for the colouration of the glass. Ni, cobalt, manganese etc. is absent while zinc has been detected in traces. The glass shows chemical durability and is free from devitrification, the Al content is within the durability limit, the silica content of 57.56 and calcium oxide to the tune of 4.16% is within the tolerable limits as an increase would have resulted in the glass to be difficult to melt and sure to devitrify. The absence of Ba is an indication that the glass is different from the Chinese as a deliberate addition or has come as trace impurities is debatable, thus the glass is different from other glasses in the respect, however, its presence has certainly improved its chemical durability and its heat resistance mechanical strain.

The presence of traces of titanium is an indication of the fact that the sand containing titanium has been used as one of the ingredients for glass manufacture. It is local in origin or has been imported from out-side, needs further investigations.

Acknowledgement

My grateful thanks are to Sarvasri P.K. Nagta and Mridul Pande for their valuable assistance in the analysis of the material.

CHAPTER XVII

EXAMINATION OF METALLIC SAMPLES

B.N. Tandon

CHAPTER XVII

EXAMINATION OF METALLIC SAMPLES

The following metallic samples were analysed :—

1. *Sample No. 179/90 (1)*: Registration No. 585, Dagger fragment layer no.7, Depth - 1·10 m Sub-period IA.
2. *Sample No.179/90 (2)* : Registration No.78, Copper fragment layer no.2, Depth - 30 cm, Sub-period IB.
3. *Sample No.179/90 (3)* : Registration No. 451, Copper nail, layer no.4, Depth - 55 cm, Sub-period IB.
4. *Sample No.179/90 (4)* : Registration No.488, Copper bead pieces, layer no. 6, Depth - 1·5 m, Sub-period IB.

	179/90 (1) Reg. No. 585	179/90 (2) Reg. No. 178	179/90 (3) Reg. No. 451	179/90 (4) Reg. No. 488
Copper	98.61%	62.5%	62.12%	60.60%
Zinc	0.066%	0.055%	0.054%	0.363%
Lead	0.277%	0.35%	5.815%	0.795%
Tin	Present in traces	12.64%	12.16%	15.99%
Silica	Absent	5.00%	5.69%	9.74%
Silver	Present in traces	Present in traces	Present in traces	Present in traces
Cobalt	Present in traces	Present in traces	Present in traces	Present in traces
Nickel	Absent	Absent	Absent	Absent
Manganese	Absent	Absent	Absent	Absent
Arsenic	Present in traces	Present in traces	Present in traces	Present in traces
Iron	Absent	0.652%	1.155%	1.515%
Sulphate	Absent	Absent	Absent	Absent
Chloride	Absent	Absent	Absent	Absent

There were no metal core in the above samples which were in mineralised form.

The four samples were metallic fragments from Bhagwanpura excavations from different stratigraphic levels. Among the four, the three were highly mineralized with colour texture varying from green to bluish green without any metal core. In the first sample bearing Registered No. 585, a complete analysis was possible.

On scrutiny of the results, it is noted that sample bearing Registered No. 585 (depth 1·10 m, Sub-period IA) is more or less copper with zinc and lead as ·066% and ·277% respectively. Arsenic is also present in traces only thus pointing out towards its pure character. The presence even in traces of arsenic provide stronger, tougher and resistant properties to the object.

Samples Reg. Nos. 178, 451 and 488

The other three samples bearing Registered Nos. 78, 451 and 488 are all alloys of copper and tin i.e. bronze. The presence of 5.815% of Pb in sample bearing Registered No. 451 assumes special significance in respect of its mechanical behaviour, as even the small content of impurities produce marked effect on the physical properties.

Acknowledgement

My grateful thanks are to Sri P.K. Nagta and Sri Y.K. Kanotra for their valuable assistance in the analysis of the material.

CHAPTER XVIII

**ANALYSIS OF SOIL SAMPLES FROM
BHAGWANPURA**

R. V. Joshi

CHAPTER XVIII

ANALYSIS OF SOIL SAMPLES FROM BHAGWANPURA

The following is the Chemical analysis of Soil Samples from Bhagwanpura:—

No.	Particulars	PH	%	%	%	%
			CaCO ₃	Organic	Nitrogen	Phosphorus
1.	A 1, Qd. 2 1.25 m B.S. Flood I	10.2	1.28	0.189	0.03319	0.3562
2.	B 2, Qd. 4 from oval shaped structure	9.75	5.12	0.420	0.0340	0.2687
3.	A 1, Qd. 2 2.85 m B.S. Flood (pre-occupation)	9.25	8.97	0.126	0.0161	0.0875
4.	A 4, Qd. oval shaped structure	10.05	3.20	0.142	0.0161	0.2187
5.	A 1, Qd. 2, 1.90-2.30 m B.S. Flood 2	9.85	5.12	0.199	0.0242	0.2000
6.	D 3, Qd. 0.35 m B.S. oval shaped structure	10.05	6.41	0.294	0.242	0.2250
7.	D 3, Qd. 2, 0.10 m B.S. oval shaped structure	10.15	7.60	0.236	0.0430	0.2437
8.	D 3, Qd. 2, 0.25 m B.S. oval shaped	10.00	7.04	0.252	0.0340	0.3187

Soils are alkaline in nature. Pre-occupation sample has .0875% phosphorous, Flood I deposit (sample No. 1) has almost four times and Flood deposit No. II (sample No. 5) has two times more phosphorus than that in the pre-occupation sample. These higher values indicate the habitation or human influence at flood level or disturbed habitational Sub-period I deposit has possibly more human influence than Flood 2 deposit. Results of organic carbon and nitrogen indicate the influence of habitation in the flood deposits since these contents are higher in flood deposits than those in pre-occupation sample. The oval shaped structure also have higher values of phosphorus, organic carbon and nitrogen.

CHAPTER XIX

**EXPLORATIONS AND EXCAVATIONS IN
HARYANA, JAMMU & KASHMIR AND PUNJAB
1976-1981**

**Jagat Pati Joshi
and
Madhu Bala**

CHAPTER XIX

EXPLORATIONS AND EXCAVATIONS IN HARYANA, JAMMU & KASHMIR AND PUNJAB 1976-1981¹

I. INTRODUCTION

During the last seven decades, 1530 settlements of Pre-Harappan, Harappan, late Harappan, Grey Ware and Painted Grey Ware cultures have been discovered in the present day boundaries of India. Out of these, 712 belong to Pre-Harappan, Harappan and late Harappan cultures, and 848 belong to Grey Ware and Painted Grey Ware cultures. Some of these sites have been systematically excavated and for some ¹⁴C and TL dates are also available. Generally speaking, Pre-Harappan and Harappan groups of settlements fall in the third millennium, the late Harappan sites in the second millennium and the Grey Ware and Painted Grey Ware sites in the first millennium. Here it may be pointed out that the Grey Ware sites fall in the Painted Grey Ware group, even though at some sites it is found in layers earlier to the layers containing Painted Grey Ware since this plain grey ware is in fact the 'associated ware' of the Painted Grey Ware.

The area covered by the Harappan settlements run from southern Jammu to northern Maharashtra, and southern Gurajat to western Uttar Pradesh, including northern Rajasthan and parts of north-western Madhya Pradesh. The area covered by the Grey Ware complex on the other hand includes the eastern parts of Harappan culture area and north-eastern parts of Uttar Pradesh and Rajasthan (fig. 52).

These settlements, some of them discovered during the course of our archaeological investigation, throw significant light on settlement-patterns during three different millennia and three different, though overlapping, contexts. The purpose was to understand and appreciate the settlement pattern of proto-historic cultures which flourished primarily in the Indo-Gangetic Divide with the help of newly acquired data.

Our area of exploration covered Baramulla in Kashmir and Jammu in eastern J and K, Kurukshetra in western Haryana, Gurdaspur in western Punjab and Mansa in southern Punjab. The field work was intensively carried out for five seasons intermittently by the authors, along with a team of Explorations Branch of the headquarters office of the Archaeological Survey of India, New Delhi, from 1975 to 1981, during which a large number of sites ranging from neolithic period to medieval period have been found. (Appendix I).

II. IMPORTANCE OF THE AREA

Generally speaking, this area has vast tracts of agricultural land to maintain large populations as rich alluvial soil is annually spread over by a viable net-work of snow-fed and monsoonal rivers.

¹ Jagat Pati Joshi, 'Settlement patterns in Third, Second and First Millennia in India - with special reference to discoveries in Punjab. - Paper read at the Seminar 'The Cultural Heritage of the Indian Village' held on 13th-14th April, 1982, Museum of Mankind, London (In Press).

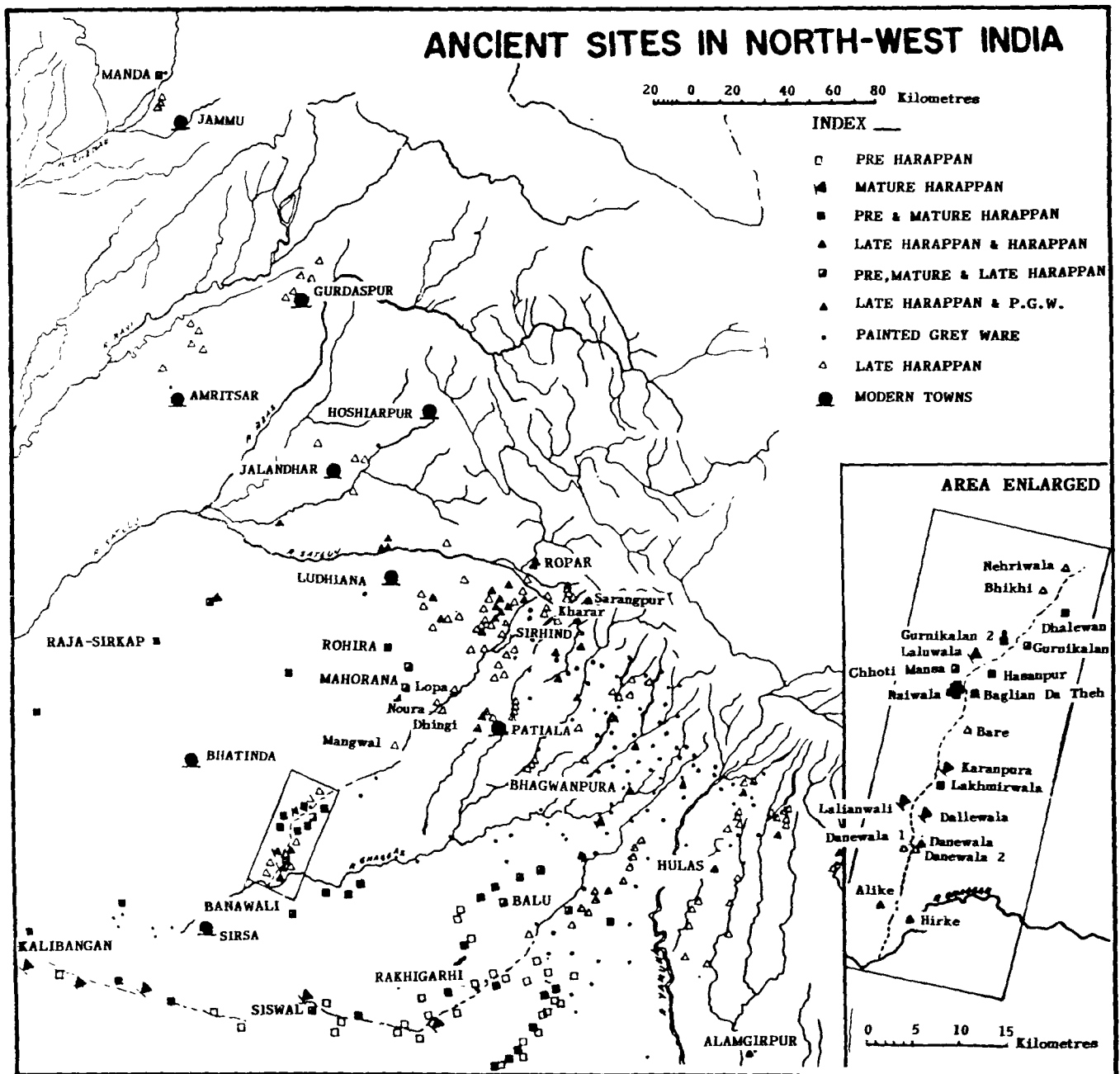


FIG. 52 : Map showing Proto-historic sites in north-west India

Climatically, the area has been very congenial for human occupation. Hydrologically, perennial rivers were available for irrigation and trade for long periods of time, although none was permanently stable as is clear from a survey of their courses.

Moreover, in Punjab and Haryana region, nearness to the Siwaliks, provided these sites easy access to sources of much needed forest wealth, such as timber for house building activities.

III. RIVER SYSTEMS

Since the patterns of settlements in this region were based mainly upon major river systems of the Chenab, Ravi, Beas, Sutlaj, Ghaggar, Sarasvati and Markanda, it is significant to note that due to frequent tectonic movements in the lower Himalayas, shift in their courses was a recurring feature. The phenomenon has been particularly pronounced in the case of the eastern rivers, such as the Beas and the Sutlaj. The same geological factor was also responsible for the drying up of the Ghaggar and the shifting channels of the Yamuna. A study of Landsat Imagery of the Punjab and Rajasthan region clearly records the shifts that the rivers experienced in this region during the proto-historic period.²

IV. RESULTS OF EXPLORATION AND DOCUMENTATION

The explorations was first undertaken in the area of south-western Jammu, Baramulla district of Jammu & Kashmir, Upper Punjab and Kurukshetra, and later on the lower regions of the Punjab were subjected to detailed survey. In all, 21 Pre-Harappan and Harappan, 24 late-Harappan and 20 Painted Grey Ware and Grey Ware settlements were located. The upto-date documentation of these settlements is, however as follows.³

Pre-Harappan & Harappan	Late Harappan	Painted Grey Ware and Grey Ware
56	191	226

A study of the data collected so far shows :

(i) Between the Harappan site of Manda (Lat. 30°54' N; Long. 74°44' E), District Jammu (J&K) to Ropar (Lat. 31°00' N; Long. 76°30' E), District Ropar (Punjab) there is only one Harappan site which has been reported at Kathua in Jammu.

(ii) About 100 sites belonging to the late Harappans have been recorded in the area running from Jammu to Kurukshetra.

² Yash Pal *et. al.*, 'Remote Sensing of the 'lost' Saraswati River', *Proceedings of the Indian Academy of Sciences* (1981), pp. 318-331.

D.P. Agrawal and B.M. Pande, *Ecology and Archaeology of Western India*, New Delhi, 1977, pp. 55-106.

³ Based on the data compilation of Pre-Harappan, Harappan, late Harappan, PGW and Grey Ware settlements and their distributional patterns done by Miss Madhu Bala.

(iii) In the lower Punjab i.e. in the region of District Mansa, adjoining District Ganganagar, Rajasthan, at least 25 Pre-Harappan and late Harappan settlements existed. Out of these, there are eight sites with Pre-Harappan and Harappan remains, one site with Pre-Harappan, Harappan and late Harappan cultures, and one with Harappan and late Harappan cultures. Besides, there are eight sites with late Harappan remains. The size of settlements varies from 200×200 m to $1,500 \times 1,500$ m (i.e. from 8.8 acre to 495 acre). In an area of about 50×25 km (1250 sq km), the settlements are situated on an average distance of 3 to 7 km.

On the basis of the area of the explored mounds, a three fold classification appears obvious. The sites with Pre-Harappan and Harappan remains belong to Group A (covering an area of about 1000×1000 to 1500×1500 m i.e. 320 acre to 495 acre). In Group B (covering an area of about 500×500 m to 900×900 m i.e. 55 acre to 178.2 acre), consisting of pre-Harappan and late Harappan occupation. In Group C (covering an area of about 200×200 m to 400×400 m i.e. 8.8 acre to 35.2 acre) Harappan and late Harappan settlements are included and the number of such sites is twelve. All these settlements are situated along the ancient Sirhind river (modern Sirhind *nala*), now a dried-up tributary of the Ghaggar, emanating from the Siwaliks, in proximity of Ropar. Geographically, this region of our exploration forms a Doab between the Ghaggar and the Sirhind.

(iv) The incidence and concentration of late Harappan settlements is much higher in the upper region where the settlers preferred small tributaries. As one moves eastwards from Jammu, towards Kurukshetra, one finds increased frequency of late Harappan settlements.

(v) At present no late Harappan site is available in the Bikaner-Ganganagar region. However, six late Harappan sites are recorded in the Mansa District.

A study of the sites documented and explored in the exploration in Punjab which is close to Jammu in the north-western side and Haryana and Rajasthan in the east and south reveals the following pattern district-wise :—

The largest number of Pre-Harappan sites (13) is available in Mansa district followed by Sangrur (6); Ludhiana, Kapurthala and Faridkot (2 each) and Ferozpur (1). Similarly the Harappan sites are in Mansa (15), Sangrur (6), Patiala and Ludhiana (4 each), Ropar (3), Faridkot (2), Amritsar, Ferozpur and Jalandhar (1 each). The frequency of late Harappan sites are in Amritsar (3), Faridkot (3), Gurdaspur (9), Hoshiarpur (2), Jalandhar (12), Kapurthala (2), Ludhiana (29), Mansa (10), Patiala (36), Ropar (14), Sangrur (9). There is a cluster of sites of late Harappan sites in Patiala, Ludhiana and Jalandhar districts.

Late Harappan pottery is found along with Painted Grey Ware and Grey Ware at one site in Amritsar, two in Jalandhar, six in Ludhiana, twelve in Patiala, one in Ropar and two in Sangrur. Late Harappan pottery with Grey Ware is available at eight sites in Gurdaspur, four sites in Ludhiana, five sites in Patiala, two sites in Ropar and two sites in Sangrur. Sites with only Grey Ware number eight in Amritsar, ten in Gurdaspur, one in Hoshiarpur, four in Jalandhar two in Sangrur. Painted Grey Ware with Grey Ware sites number two in Amritsar, one in Hoshiarpur, two in Jalandhar, ten in Patiala and one in Sangrur.

The exploration suggests that there are separate sites with the Grey Ware which is generally associated with PGW. These are in District Gurdaspur where Painted Grey Ware as such is not available. There are presently ten mounds in Gurdaspur with this Grey Ware. However, it is known that

as one moves towards the east in the districts of Amritsar, there are eight mounds yielding Grey Ware, four in Jalandhar, one in Hoshiarpur, two in Ludhiana and one in Patiala. Thus, the survey shows that separate mounds of Grey Ware become fewer and fewer as one moves from west to east. It has also been observed that at present Painted Grey Ware with Grey Ware and associated Red Ware occurs from Amritsar towards the east. It has been noticed that there is a concentration of Painted Grey Ware sites in District Ropar, four in Patiala, six in Jalandhar, two in Sangrur, and three in Amritsar (none in Ludhiana). Patiala District has the largest number of sites—with both Late Harappan and Painted Grey Ware (Appendix-I).

(vi) The concentration of Painted Grey Ware settlements is available in the eastern side of Punjab and Haryana, and it slowly tapers down towards the south-west, as the sites are lower in frequency in the southern region of the Punjab. In Ganganagar district there are very few sites of this complex. Along the upper Ghaggar-Hakra in Pakistan, there are only fourteen sites.

V. THE EMERGING PICTURE

The picture that emerges from the above mentioned data shows that the Pre-Harappans were followed by the Harappans, and significantly enough on the same sites; there is no separate settlement of the Pre-Harappans. However, there are separate settlements of the Harappans, a fact which might show that the change from the Pre-Harappan to Harappan took place locally, when the Harappans outnumbered the Pre-Harappans.

The availability of twenty five sites in an area of approximately 50 km × 25 km (i.e. 1250 sq. km) in Mansa District shows that this area was a very important zone in the Harappan culture-area. (Appendix II) The Pre-Harappans and Harappans preferred the Ghaggar and its tributaries as this was more static river-system than the Beas, Satluj and Ravi which were erratic in their behaviour and changing their courses very often. The Sirhind, a tributary of the Ghaggar, was one of the most important lines of communication between Punjab and Rajasthan for getting raw material like timber, especially *Deodar* used in house-building activities, as noted earlier. This channel appears to be buzzing with activity in the third and second millennia. Studies of the settlement-pattern of the area suggests that it had three types of settlements ; (1) Cities (Group A) of about 1500 × 1500 m area, such as Dhalewan, Gurnikalan, Baglian Da Theh, Lakhmirwala and Hasanpur. These are generally situated at a distance of 3 to 5 km from each other. (2) In between, there appears to be six towns also (Group B), ranging in area between 900 × 900 m and 500 × 500 m at Karampura, Dallewala I, Sahnewali, Hirke, Dallewala II and Bare II. It has been observed that all the cities and towns were situated on the eastern side of the river where denudation by floods was less, while a series of villages, numbering 14, covering approximately an area of 200 × 200 m to 400 × 400 m. Alike, Denewala I, Danewala II, Chhoti Mansa, Lallianwali, Luluwala, Bhikhi, Gurni Kalan II, Nehriwala, Naiwala I to V are situated on the western side which was subjected to occasional floods (see Appendix II). At present, also, big cities on the Yamuna are situated on the southern side of the river where the thrust of floods is lesser. This area, therefore, gives the best evidence of all the three types of settlements placed near each other, creating an ideal situation of an urban complex. Their commercial interaction was the pre-requisite for a

developed civilization. It seems that Sirhind was an important 'economic pocket' which mobilized the resources of the northern region of the lower Himalayas and transported them to Bahawalpur area via Kalibangan, and also to Harappan sites in Haryana and Punjab. The situation is almost the same which exists in Kutch which was a half-way house with a concentration of as many as 25 sites between Sind and Gujarat. It may be pertinent to mention that there was yet another 'economic pocket' on the same Ghaggar in the Bahawalpur region where M.R. Moghul has located about 250 sites in an area of 1000 sq. km from Yazman to Derawar Fort⁴.

(1) The Ghaggar was a mightier river than the Indus with its own net-work of tributaries along which lay hundreds of sites with at least three 'economic pocket'; one northern—along Sirhind and Saraswati; second central—in Bahawalpur area and the third southern—in Kutch.

(2) The Pre-Harappan and Harappan settlements were largely located along the major and perennial rivers. This was obviously due to the fact the urban phase of the civilization had the technological capabilities to thwart the onslaught of the seasonal and occasional floods by erecting high defences and platforms.

(3) The explorations have clearly established the fact that due to the erratic behaviour of the Ravi, Beas and Satluj, the Harappans did not patronize them for their settlements except occasionally. Therefore no major Harappan site is available between Manda and Ropar although the area has been subjected to intensive exploration. However, it appears that during the late Harappan times preference for settlements on the tributaries of those major rivers gained impetus. Due to economic poverty and population shrinkage, they were unable to maintain protection platforms and, therefore, moved to the tributaries in higher regions, towards the north where water was still available and the danger of flood was of a comparatively lower magnitude. This was almost the same in western U.P. where during the late Harappan times the tributaries of the Jamuna such as Krishni and Hindon in the districts of Saharanpur and Bulandshahar were favoured for large number of their settlement⁵. The same situation is met with in Gujarat. It appears that this phase of late Harappans started at some point of time when they were inhabiting Mansa district as attested to by six late Harappan sites. Significantly, this stage is not found in Rajasthan. It has also been observed that the concentration of late Harappan sites is more in upper region, most probably due to the fact that this movement brought them nearer to the sources of natural produce, as noted earlier.

(4) The present study has also revealed the eastward movement of late Harappan and the Painted Grey Ware cultures. This aspect is borne out by the increase in frequency of sites from the west to the east.

(5) It appears that PGW culture entered northern Rajasthan from eastern Punjab and Haryana (where there is a concentration of these settlements) through the Ghaggar.

⁴ J.P. Joshi, 'Explorations in Kutch and Excavation at Surkotada', *Journal of the Oriental Institute*, Vol. XXII, Nos. 1-2, September-December 1972 pp. 98-144.

G.L. Posschl, *Indus Civilization in Saurashtra* (New Delhi, 1980), pp. 40-77; M.R. Mughal, 'New Archaeological Evidence from Bahawalpur', *Man and Environment*, Vol. IV (1980), pp. 93-98; M.R. Mughal, 'Present state of Research on the Indus Valley Civilization,' *International Symposium on Mohenjodaro* (Karachi, February, 1973).

⁵ K.N. Dikshit, 'Excavations at Hulas and further exploration of the Upper Ganga-Yamuna Doab', *Man and Environment*, Vol. V (1981), pp. 74 ff.

(6) It has also emerged from the present survey that Baran element having Pre-Harappan lineage has its dispersal only with late Harappan sites in the upper Punjab and Haryana and it is totally missing in the southern region. This may perhaps indicate that Barans has more intimate cultural contact with late Harappans during their second phase of existence in the upper Punjab region.

(7) It has also been observed that a type of incised red ware having varied designs is available in Pre-Harappan settlements.

(8) Though the element of Cemetery H red ware is present in some of the late Harappan settlements in the Punjab and Haryana, no exclusive settlement of Cemetery H is available. In fact, the users of Cemetery H pottery had their settlements confined to Harappa and Bahawalpur area and did not substantially occupy Punjab and Haryana. The stray finds may suggest a contact.

In conclusion, it may be stated within the domain of the Indus Civilization the evidence from Mansa district for the first time provides an important aspect of settlement pattern of the Indus Civilization: that there are 'economic pockets', with the close circuits of villages, towns and cities in compact areas. Such pockets have their own role to play in our understanding of the settlement pattern of the eastern Harappans. The present evidence also throws welcome light on the settlement-pattern of the Painted Grey Ware Culture. The two, put together, shows that the settlement-pattern of the proto-historic cultures in this part of India was Primarily dependent on the changing patterns of the rivers. In other words, hydrological changes affecting adversely the availability of water in the middle and lower courses of the perennial river-systems like the one we observe in the Ghaggar-Sarasvati, made the Harappans leave their settlements and break their urban fabric for ever. In the wake of these two phenomena lies the fragmentation of cities, both demographically and qualitatively. No wonder, the number of late Harappan sites register manifold increase but in a non-urban context of smaller and shallower settlements located much closer to each other than earlier. The movements of the late Harappans favour areas in the northern parts of the present Punjab, Haryana and northern Uttar Pradesh since in these regions the older river systems still retained water. Not only that, the directional changes in the settlement pattern from the Harappan to the late Harappan has been from the west to the east and from the major river-valley to the tributaries. During the Painted Grey Ware times, middle courses of the rivers like the Ghaggar, Sarasvati and Drishdvati became active, albeit limitedly. Still the direction of movements remained the same: from the west towards the east. However, two new areas were occupied—Palaeo-Yamuna channel in the Bharatpur district of north-eastern Rajasthan and the Ganga system in north-eastern Uttar Pradesh. The extension was more or less in the same region where once the Copper Hoards and the ochre coloured pottery proliferated.

VI. SOME IMPORTANT EXPLORED SITES IN PUNJAB

(1) DHALEWAN (Pl. LXVII)

The site at Dhalewan (Lat. 75° 30' N; Long. 30° 02' E) is situated in Mansa district, Punjab. It is about 60 kms from Bhatinda on Bhatinda-Patiala road and about 20 km from Sunam railway station and about 7 kms from the township of Bhikhi. The approach to Dhalewan from Bhikhi is by a partially

kachha and *pacca* road which is negotiable by a jeep or by a bullock cart. The mound suddenly emerges out from the adjoining low sand-dunes and lush green fields. Presently the mound is situated on the eastern side of the canal locally called drain which has been dug on the dried up bed of the ancient Sirhind Nalah. As one could see from far away the mound is very impressive, having a height of about 10 m. and measuring 500 m north-south and about 800 m east-west. The mound is capped by a *Marhi*, *Neem*, *Babul* and a huge banyan tree around which a circular depression has been dug. Besides these, otherwise the mound had more area of ancient occupation which has been now brought under cultivation which is attested to by the find of pottery in the adjoining fields. The mound, as such, is quite intact and it is interesting to note that besides the pottery, some of the structural remains are also available right on the surface of the mound itself.

During the exploration, broadly speaking, Pre-Harappan, Harappan, Late Harappan, Rangmahal and a sprinkling of medieval ware are available. Pre-Harappan ware is identified by the typical fabric 'D' of Kalibangan I, having a variety of incised designs; painted ware consists of horizontal lines, latticed diamond pattern cut into shapes of triangles, cord designs on exterior; a thick black banded painted red ware having similarity with pre-defence pottery from Harappa and Kot-diji.

The Harappan pottery has all the typical shapes, e.g. dish-on-stand, perforated jars, 'S' shaped jars, etc. The design repertoire in painted pottery consists of horizontal bands and plant motifs. The Rangmahal pottery is recognized by its typical paintings, shapes and fabric.

Other finds include terracotta beads, animal figurines, shell, terracotta and faience bangles, shell objects, copper piece, steatite disc beads, terracotta dabbers, terracotta balls, cherts blades, etc. Another interesting feature which has come to notice is a small blade industry in semi-precious stones which very well compares with similar small blades from Kalibangan, Period I. Besides these, terracotta cakes having all shapes comparable to Kalibangan are available from the site.

An overall estimation of the explored material suggests that the site at Dhalewan has comparable material with Kalibangan.

On the northern side of the mound remains of a mud-fortification wall having an available length of 55 m and a width of 1.80 m is available. The bricks used in this wall are having the dimension of 40 × 30 × 10 cm definitely indicating the Pre-Harappan size.

(2) BAGLIAN-DA-THEH (PL. LXVIII)

The mound at Baglian-Da-Theh (Lat. 29° 49' N; Long. 75° 31' E) is situated near the village Narendrapura, Mansa District. The exact situation of the mound is about 4 km from the village named Bare on the left side of the drain. The size of the mound is about 800 × 800 m and a height of 8 m. The entire landscape is marked by the accumulation of sand-dunes and vegetation consisting of low *Babul* trees and bushes.

During the course of exploration, the site has yielded Pre-Harappan, Harappan, Rangmahal and medieval wares. Among the Pre-Harappan pottery, Fabric 'A', 'B' and 'D' of Kalibangan type is available. The Harappan pottery consists of goblets, perforated jars, jars, dish-on-stand etc. The painted designs repertoire consists of horizontal bands, chess patterns and typical Indus *Pipal* leaf motif. Other

finds include terracotta animal figurines, shell and faience bangles, blades, terracotta cart frames, beads, terracotta dabbers, etc. Amongst the terracotta bangles both painted and unpainted varieties are available. The site has yielded Rang Mahal pottery along with numerous terracotta animal figurines, one stèle depicting the hind portion of a bull and a mould of a female figure.

The site is well preserved except for the cultivation on the surface of the mound.

(3) LAKHMIRWALA (PL. LXIX)

The site at Lakhmirwala (Lat. 29° 47' N; Long. 75° 22' E) is situated in Mansa District. The site is about 10 km. from Mansa on Kawali-Chachur road. As a matter of fact this road cuts across the mound. The area of the mound is very large and at the time of exploration, it was fully under the cultivation. The area of the mound can be determined by the scatter of the pottery which covers an area 1500 × 1500 m. The mound has an approximate height of about 10 m. Since the area is too big and there is also a depression in northern side the possibility of two mounds in the region cannot be ruled out. A portion of a mud-brick wall belonging to the Harappan culture having mud-bricks of the size of 10 × 20 × 40 cm has been also noticed on the surface of the mound.

The site has yielded typical Pre-Harappan and Harappan wares. In the Pre-Harappan wares ample amount of fabrics 'A', 'B' and 'D' are available. In the Harappan assemblage dish-on-stand, beaker, perforated jar etc. are met with. Amongst the other finds include chert blade, faience and terracotta bangles, terracotta cakes and terracotta hubbed wheels. Amongst the Pre-Harappan and Harappan sites discovered so far Lakhmirwala is one of the biggest sites in this area.

(4) NAI WALA THEH

The site at Nai Wala Theh (Lat. 29° 55' N; Long 75° 30' E) is situated in Mansa District. It is about 5 km. from the village Bare on the left side of the drain. The mound is about 1 km from the site Baglian Da Theh. The mound covers an area of 400 × 400 m having an approximate height of 5 m. The area is having five separate mounds which are partially covered by sand dunes.

During the course of exploration, the site has yielded Pre-Harappan, Harappan and Rangmahal pottery. Amongst Pre-Harappan pottery, fabric 'D' is available more than the other fabrics. The incised designs in this fabric are having wavy lines and horizontal lines. The Harappan pottery is represented by perforated jars and big jars. Rangmahal pottery is also available.

Antiquities include all types of terracotta cakes, terracotta beads and shell pieces. The site is well preserved.

(5) GURNIKALAN-I

The ancient site at Gurnikalan (Lat. 29° 50' N; Long. 75° 30' E) lies in Mansa District. The site is about 65 km from Bhatinda on Bhuladda-Bhikhi road and about 10 km south of Dhalewan. The mound is situated about 5 km before Bhuladda township. At present the site has come under agricultural operation. The area of the mound is about 1200 × 1200 m having an approximate height of 10 m.

The site has yielded Pre-Harappan, Harappan, late Harappan and Rangmahal pottery. Pre-Harappan fabric 'D' has been found in a large quantity bearing the incised designs consisting of wavy lines and horizontal lines.

In Harappan ware, perforated jars and 'S' shaped jars are available. Harappan grey ware has also been found. Kushan bowls, lids, jars including tamped pottery is also available.

Antiquities include all types of terracotta cakes, faience and terracotta bangles and animal figurines.

(6) GURNIKALAN-2

The site named as Gurnikalan-2 (Lat. 29° 58' N; Long. 75° 30' E) is located in Mansa District. Locally, people also called the area as Gurna or Rohi. The mound is about 2 km from the village Hasanpur. It is on the left side of the dried up drain. The site is now almost cultivated and there is no mound as such visible now. The undisturbed area which is left is about 400 × 400 m having a height of 4 to 5 m.

The pottery types available from the site are Pre-Harappan, Harappan, Late Harappan, Painted Grey Ware, Grey Ware, black slipped ware, black and red ware, and a sprinkling of Kushan pottery. It appears to be a very rich site from the point of view of culture sequence. In Pre-Harappan pottery, fabric 'D' with horizontal lines and wavy lines is available. A few sherds of fabric 'B' are also found.

In Harappan pottery perforated jars and 'S' shaped jars and dish-on-stand are met with.

In Painted Grey Ware bowls and dishes are available. A new shape, a miniature bowl, could also be traced in this assemblage. Mostly vertical and horizontal lines are painted.

Grey ware associated with Painted Grey Ware is also represented by bowls and dishes in very fine fabric.

Kushan pottery with stamped designs and bowls are available from the site.

Antiquities include steatite beads, shell beads, terracotta and faience bangles, stone pestles, terracotta animal figurines etc.

(7) HASANPUR-2

The site Hasanpur-2 (Lat. 29° 58' N; Long 75° 30' E) is situated in Mansa District. The mound is about 2 km from the village Hasanpur. It is about 6 km before the township Bhuladda on the left side of the drain. The mound is surrounded by green fields. The area of the mound is about 1000 × 1000 m having an approximate height of 10 m. From the distance of the mound appears to be a sand dune but close examination revealed its archaeological potential.

Pre-Harappan, Harappan and Kushan pottery is available. In Pre-Harappan, fabric 'D' with incised wavy lines, horizontal lines, has been found from the site. Harappan pottery includes dish-on-stand, jars and perforated jars. Typical Kushan bowls and jars are also found. Other finds include faience and terracotta bangles, terracotta cakes, a bead of lapis-lazuli, terracotta animal figurines and a copper wire piece.

VII. EXCAVATION

1. EXCAVATION AT KASITAL, DISTRICT KURUKSHETRA (HARYANA)

At Kasital, a small-scale excavation revealed a three-fold culture-sequence with evidence of three successive floodings of the site by the river Sarasvati (pl. LXX). The earliest occupation, Period I, is characterised by the occurrence of Painted Grey Ware, besides a sherd of black and red ware. Some shapes in the red ware obtained from this period are reminiscent of the well known Ahichchhatra 10-A types and rimless *handis*, *ghata* shaped beads of terracotta, a dagger shaped pendant of ivory are the noteworthy finds from the Painted Grey Ware levels (pl. LXXI A). Of the structural remains mention may be made of a circular barn with 2.05 diameter and a mud wall with post-holes.

Period II belongs to the historical times. The occupational deposit, however, was found to be very much disturbed by pits of the medieval period.

Period III is represented by disturbed layers belonging to medieval times (pl. LXXI B).

Although this site is very near to Bhagwanpura, it has yielded a sequence wherein Painted Grey Ware horizon is of a later phase which is quite interesting and thus shows two waves of Painted Grey Ware people settling in the Haryana area.

2. EXCAVATION AT MANDA, DISTRICT JAMMU, JAMMU AND KASHMIR

The ancient site at Manda⁶, Akhnoor (Lat. 36°54' North; Long. 74°48' East) lies on the right bank of the River Chenab, a tributary of the Indus, on the foot-hills of Pir Panjal Range. It is about 28 km northwest of Jammu. One has to climb about one km from the local bus stand to reach the site (fig. 53).

Most of the ancient site is inside the ruined fort of Manda, which was constructed in the 18th century A.D. The area of the fort is about 500 by 500 meters, the northern side of which is occupied by the Tehsildar's Office, police station and other government residential quarters, the rest of the area is covered by the remains of the palace, popularly known as Sheesh Mahal. The eastern area is covered by thorny bushes, wild vegetation and *babul* trees. The elevated mound gives a commanding view.

⁶ *Indian Archaeology 1976-77—A Review*, pp. 120-21.

Jagat Pati Joshi and Madhu Bala, 'Manda a Harappan Site in Jammu and Kashmir' in *Harappa Civilization* (ed.), Gregory L. Possehl (New Delhi, 1980), p. 185 ff.

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B.B. Lal, 'The Indo-Aryan Hypothesis vis-a-vis Indian Archaeology.' Paper read at the seminar on ETHNOGRAPHIC PROBLEMS OF THE EARLY HISTORY OF THE PEOPLE OF CENTRAL ASIA AND INDIA IN THE SECOND MILLENNIUM, B.C. Dushanbe, Cyclostyled copy.

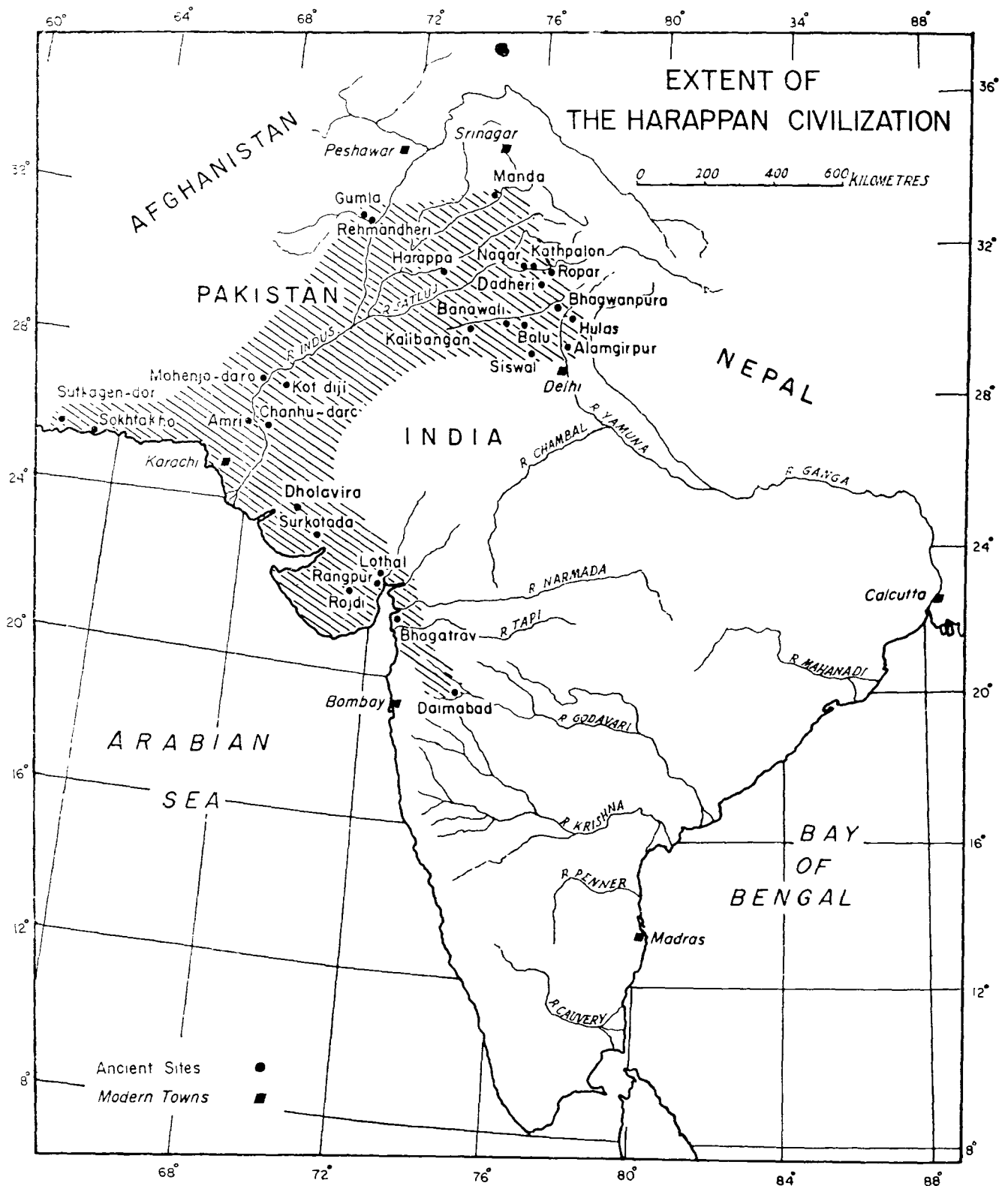


FIG. 53 : Map showing extent of Harappan Culture

Previous Work

In 1973, consequent upon a request made by the military authorities who accidentally found some ancient pottery and coins at Manda Fort, the North Western Circle (then known as the Frontier Circle) of the Archaeological Survey of India put in three trenches. These excavations mostly revealed antiquities and remains of the Kushan Period. However, in 1975, the pottery of various levels was again carefully examined and it was found that fragments of perforated jars, goblets and beakers, dish-on-stand in Harappan Red Ware was also found in the collection. Accordingly, in December, 1976 the site was further explored and examined by a team from the Exploration Branch of Archaeological Survey of India led by the senior author. This team had already excavated at Bhagwanpura (District Kurukshetra; Haryana), Dadheri (District Ludhiana), and Katpalon and Nagar (District Jalandhar). It had also explored a large region in the Punjab and brought to light the overlap phase of Late Harappan and Painted Grey Ware. Besides re-examining the site at Manda in terms of its Harappan affiliation, the team was also in search of a further possible extension of the Grey Ware, of overlap period in this area. The exploration revealed the existence of Harappan, Late Harappan Red Ware, Grey Ware, and Black Ware as well as Kushan Wares at Manda.

Excavation

In order to determine the sequence of cultures at Manda, a 20 × 6 m trench was laid on 15 April, 1977 at the highest available point in the mound. The trench had a north-south orientation between the overhead water reservoir and Sheesh Mahal. Deep digging was only done in the northern, central and southern sectors of the trench since intervening Kushan structures had to be preserved. The excavations revealed a threefold sequence in a cultural deposit of 9-20 m (pl. LXXII). The deep digging, which brought to light the earlier material, was restricted to small areas (fig. 54).

SUB-PERIOD IA This sub-period is marked by the arrival of Harappans represented by a deposit of 1.00 to 1.40 m with eight layers, i.e. 20-27. It is interesting to note that the pottery is generally from two different ceramic traditions : (1) Pre-Harappan Red Ware, and (2) Harappan Red Ware.

1) Pre-Harappan Red Ware

Statistical analysis has revealed that the Pre-Harappan pottery comprises of 15 to 25% of the total in the earliest levels. It slowly diminishes in the upper levels of this phase (fig. 54, graph). The pottery is Red Ware with coarse fine and medium fabrics. Some of the sherds have an ochre colour and the slip flakes off due to waterlogging. Most of the pottery has a well-oxidized core and was generally treated with an external red slip. Jars with featureless rim are represented which are medium to miniature in size. Painting is usually on the neck and shoulder in the form of a thick black band; however thin bands are also available. A few sherds show parallel grooves below the painted surface. This pottery is reminiscent of the Pre-defence⁷ phase at Harappa and Kalibangan I (Fabric C). A rusticated ware

⁷ Sir Mortimer Wheeler, 'Harappa 1946: the Defences and Cemetery R-37'. *Ancient India*, no. 3 (New Delhi, 1947), pp. 58-130.

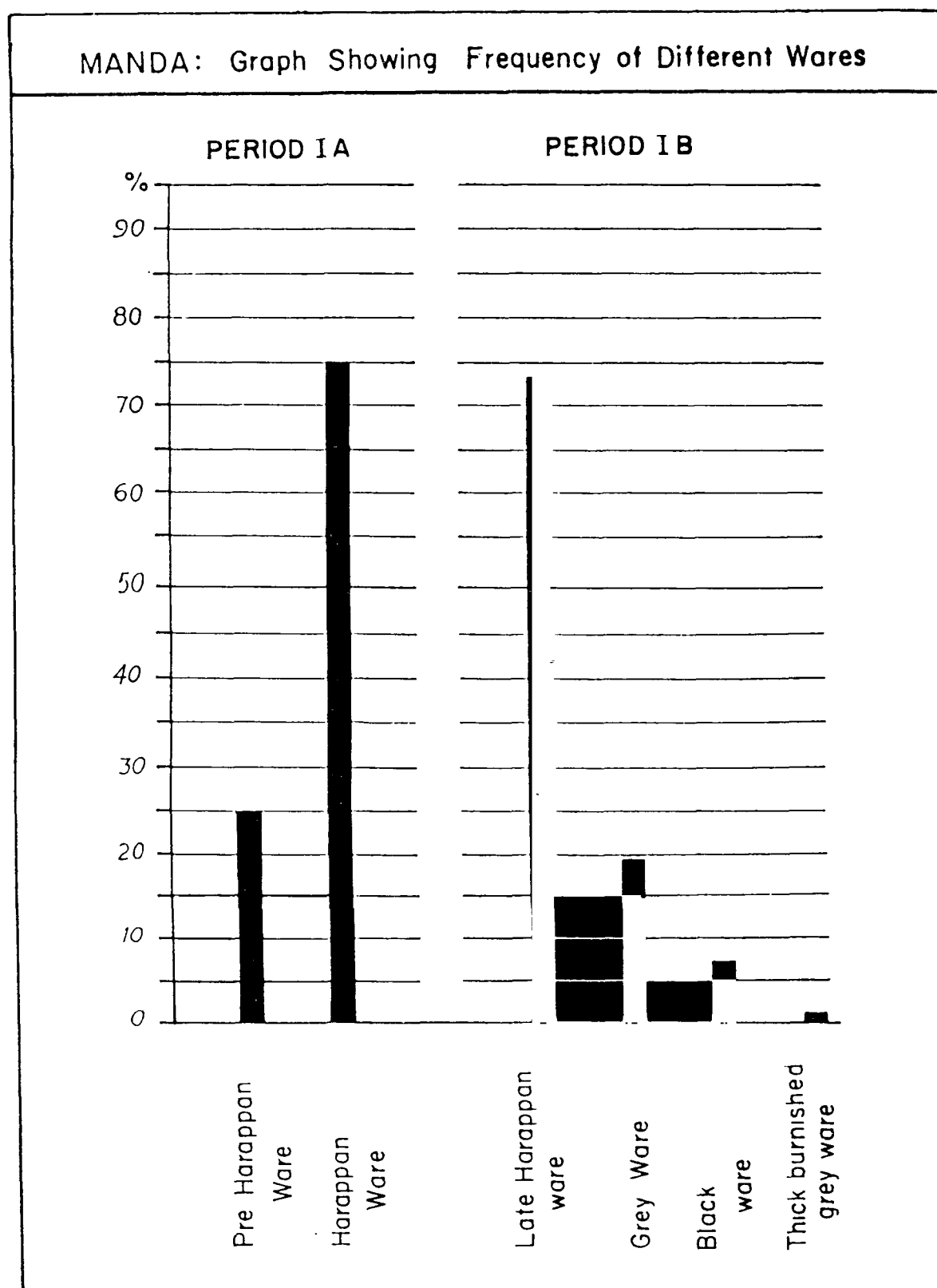


FIG. 54 : Graph showing frequency of different wares at Manda

(mostly jar fragments) is available which is akin to Kalibangan I Fabric B. A ware deeply grooved on the inner surface, possibly in the form of basins or troughs, is comparable to Fabric D of Kalibangan I. The general feel of the pottery brings it nearer to Pre-defence Harappa⁸. One sherd of Reserve Slipped Ware (?) was also found (fig. 55).

2) Harappan Red Ware

The bulk of the pottery is Harappan sturdy red ware of medium to fine fabric with painted, unpainted and incised (fine grooves) decorations. The shapes are represented by bowls, dishes-on-stand, cups with footed base, goblets, beakers, basins and jars. No perforated jars were found during the present excavation; however the earlier work did produce them. The design repertoire consists of only horizontal bands in black pigment.

A few sherds of Harappan variety of Grey Ware were also found.

The antiquities from Sub-period IA include a copper double spiral headed pin (pl. LXXIII A), 12.8 cm in length. This object has West Asian affinities⁹. There are also bone arrow heads with a tang, clay bangles, terracotta toy cart-frame, terracotta cakes, pot sherds with Harappan graffiti, chert blades, an unfinished seal (3 × 3 cm) and a few saddle querns and pestles (pls. LXXIII B-C). Considerable rubble in a horizontal accumulation may suggest a fallen wall in layer no. 23 of this period.

SUB PERIOD IB: The next period is designated Sub-Period IB. It has a deposit of 1.60 to 1.70 m consisting of two layer, nos. 18 and 19. There are four distinct ceramic traditions in this assemblage: Harappan Red Ware, (2) Grey Ware (1), generally associated with Painted Grey Ware, (3) a small quantity of Thick Burnished Grey Ware and (4) Black Ware. No Pre-Harappan Ware is available. Terracotta cakes are also not present. In Harappan Red Ware there are jars, dishes and dishes-on-stand in considerable quantity but beakers and goblets are absent. The Grey Ware is represented by bowls and dishes. Straight-sided bowls also occur in this ware. It may also be mentioned that shapes commonly found in Bara Ware and Cemetery H Ware in varying sites of the Punjab and Haryana were not found in this Sub-period during the present excavation. Neither has iron been found in this Sub-period. An overall estimation of the ceramics suggests that the Grey Ware, generally associated with Painted Grey Ware is 7 to 19 percent. Thus there is an interlocking of these two ceramic traditions evidently showing the overlap of the two cultures at this site.

PERIOD II : The next period, designated Period II, has a deposit of 1.70 to 2.00 m. There are five layers (13-17) represented by the pottery of the early historical period. This includes dishes, bowls, handis with a featureless rim, miniature pots, etc., all in Red Ware. The pottery of this period can be compared with the contemporary types available from many other excavations in northern India.

PERIOD III : Closely following Period II, is Period III with Kushan pottery, both incised and plain. The cultural deposit, of 1.70 to 1.90 m, has six layers (7-12). Pottery shapes include jars, dishes, spouted

⁸ *Indian Archaeology, 1962-63—A Review (IAR)*, Excavations at Kalibangan, District Ganganagar, pp. 20-31.

⁹ S. Piggott, 'Notes on Certain Pins and Mace Head from Harappa', *Ancient India*, no. 4 (New Delhi, 1948), pp. 26-40.

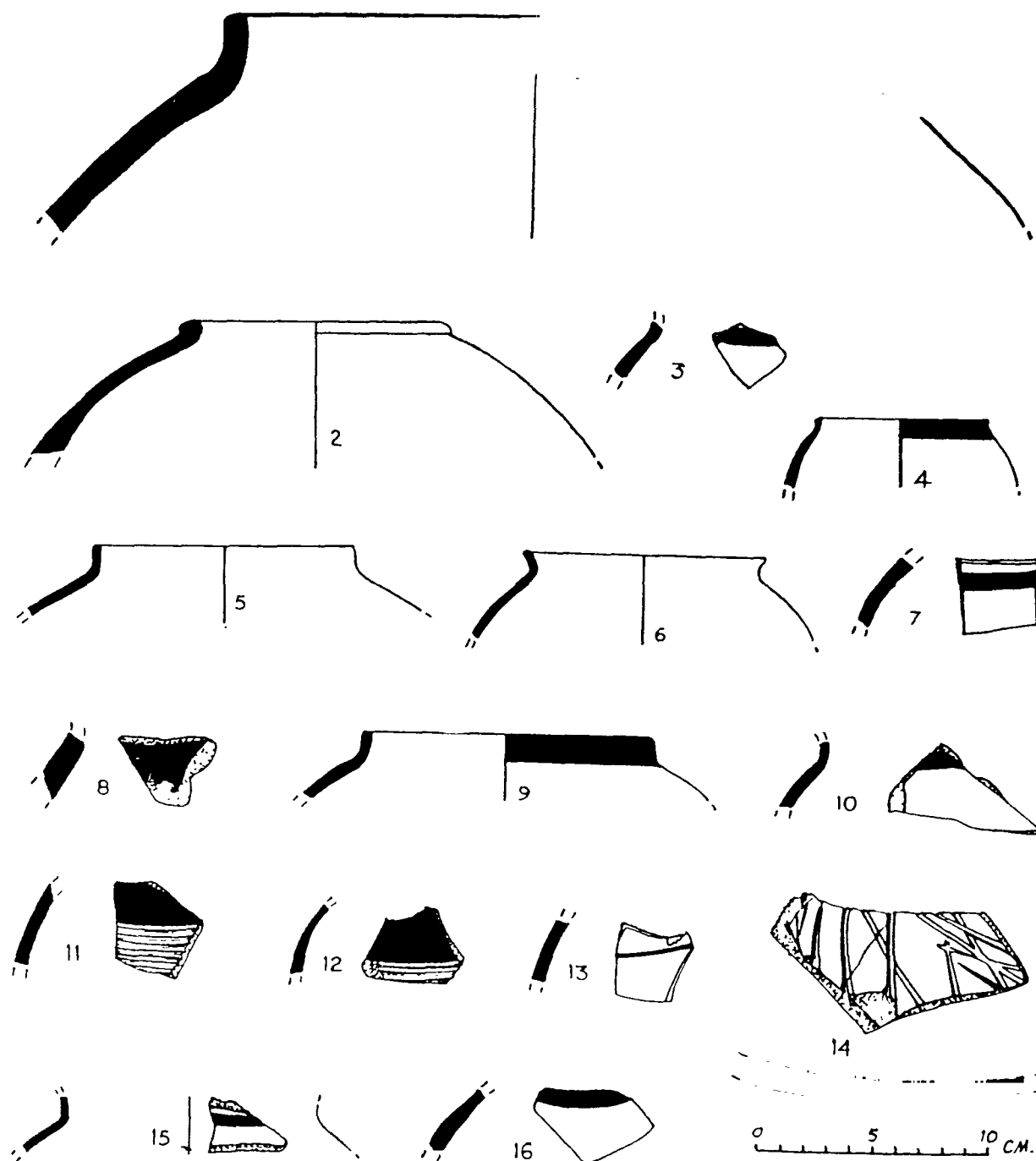


FIG. 55 : Manda Pottery from Sub-period 1A

vessels, handled vessels and lids. There is a variety of incised designs in the pottery. A beautiful *Swastika* was stamped on one sherd. Vegetal and floral motifs are included in the incised and stamped pottery.

The antiquities of Period III include glass bangles, a terracotta figure of a horse with a saddle, votive tanks, beads, stoppers, birds, a lady playing on a small drum (headless and legless), bone arrow heads, stone caskets, iron daggers and arrow heads as well as copper and antimony rods and fragments. A few copper coins and some stone rotary querns are the other interesting finds.

A partially exposed house with walls made of rubble diaper masonry, flanked on both sides of a 3 m wide street, is impressive.

It appears that after the Kushan Period the site remained deserted. The various pits and deposits represented by layers 1 through 6 found on the upper levels, represent construction activity of the 18th and 19th century. This is when the fort and the Sheesh Mahal were built by Raja Gulab Singh.

In Sequel

The discovery of the Pre-Harappan pottery with Harappan Ware in Sub-period IA at Manda shows that the Pre-Harappans survived here and coexisted with Harappans. It is rather significant that this northernmost site of the Harappan Civilization in India has both Pre-Harappan and Harappan remains together in Sub-period IA. To some extent the position is similar to the KLB-2 mound at Kalibangan, where both Pre-Harappan and Harappan remains were found together until the middle levels. Though 14C dates are not available for Period IA the double spiral-headed pin from the middle levels can be dated to *circa* 2100 B.C.

There is a clear Pre-Harappan evidence in Jammu at Manda. There is also a solitary Red Ware with the "horned design" of Pre-Harappan type from Burzhom in the Kashmir Valley. It occurs in a Neolithic context and is a thought-provoking pointer to possible contacts between Neolithic people and the Pre-Harappans. How did this happen? This question needs careful study in future discoveries and analysis. However, it must be borne in mind that chronologically the Pre-Harappans and Harappans are not far removed from the Neolithic time bracket in Kashmir.

In Sub-period IB at Manda, the Mature Harappan Period is immediately followed by the overlap of Late Harappan Ware and Grey Ware. By way of correlation, it appears that the earlier two layers of Sub-period IB of Bhagwanpura are equivalent to Sub-period IB at Manda. At both the places, Black Ware is also available. The Bara and Cemetery H elements are absent at Manda in Sub-period IB. Presently, Manda appears to be beyond the influence of the Barans.

At Manda IB, the presence of two traditions of Grey Ware is available : (1) Grey Ware, generally associated with Painted Grey Ware in the Punjab and Haryana, and (2) Burnished Thick Grey Ware. These wares are associated with Late Harappan pottery but without goblets, beakers and terracotta cakes.

On the basis of the above evidence, it appears that the Late Harappans came into contact with a Grey Ware-using people in the first instance and then with Painted Grey Ware people.

Chronology

No material for absolute dating is available at Manda; however, on the basis of Pre-Harappan Wares the beginning of Sub-Period IA can be dated to slightly earlier than about 2350 B.C. and the end of *circa* 1750 B.C. The spiral-headed pin suggests a date of *circa* 2100 B.C. for the middle levels of Sub-period IA. The beginning of Sub-period IB anticipates an overlap of Grey Ware with Late Harappan Wares. This compares well with Bhagwanpura IB (earlier levels) where only Grey Ware has been found. However, it must be borne in mind that Manda did not have a Bara or Cemetery H element.

3. EXCAVATION AT DADHERI, DISTRICT LUDHIANA, PUNJAB

With a view to further confirm the interlocking of Painted Grey Ware Culture with the last phase of the late Harappan culture as found at Bhagwanpura, District Kurukshetra, excavations were carried out at Dadheri (Lat. 30°40' N; Long. 76°15' E) 5 km east of Govind Garh, District Ludhiana, Punjab. It is interesting to note that the excavations at this site have further corroborated the position and Painted Grey Ware Culture is once again found interlocked with Late Harappan Culture.

SUB-PERIOD IA : The excavation has yielded a three-fold sequence in a cultural deposit of 6 m. The earliest settlers at the site in Sub-period IA were late Harappans. They built a settlement consisting of huts and mud walled houses over solid rammed mud platforms. Evidence of a mud wall running in east-west direction in a oblique fashion having a length of 1.70 m and width of .50 m has been found. Besides this the post-holes suggest that people were living in huts also (pl. LXXIV).

The late Harappan Culture is represented by the sturdy red ware both painted and plain. The shapes include jars, dishes-on-stand, etc. The design repertoire consists of horizontal bands, criss-cross patterns, filled in arches and hatched lozenges etc. A large jar having painted and incised design is one of the most fascinating find from this level. A considerable amount of incised pottery having a Pre-Harappan lineage has been also found (pls. LXXV and LXXVI A).

Other finds include large number of faience bangles, terracotta, wheels with single and double hubs, beads, a painted terracotta bull, copper objects, beads of carnelian and lapis-lazuli.

SUB-PERIOD IB : The excavations have revealed interesting evidence of the house types of the Painted Grey Ware Culture. At first the people were living in semi-circular huts as attested to by the discovery of post holes. Three oval structures of burnt earth, having domical roof perhaps of religious character, have been found. In the next stage the houses were built of mud walls. A complete room measuring 1.10 × 2.50 m of a house-complex has been exposed. The last phase is represented by a wall made of brick bats and brick jelly. Two sizes of bricks with finger impressions have been found.

The sizes are 12 × 12 × 7 and 25 × 20 × 5 cm.

The pottery obtained from Sub-period IB included Painted Grey Ware, Grey Ware, Black Ware associated red ware and late Harappan Ware. The percentage of Black Ware is much more than found at Bhagwanpura in similar context.

The antiquities included faience bangles, beads of semi-precious stones and terracotta, terracotta wheels, terracotta *ghata* shaped beads, a copper ring and bone pins (pl. LXXVI B). No iron has been found.

The site was deserted after Sub-period IB for a long time. However, a few sherds of Kushan affinity have been found, but no regular habitation as such could be discerned in the present excavations. In Period II, the site was again occupied during the medieval times which is represented by a few sherds of glazed ware and red ware. Shapes included knife-edge bowls, incense burners, jugs and spouted vessels. Terracotta animal figurines, ear ornaments, beads, wheels and gamesmen are other finds from this period.

The excavations have completely corroborated the results of Sub-period IA and IB with Bhagwanpura.

4. EXCAVATION AT NAGAR, DISTRICT JALANDHAR, PUNJAB

At Nagar (Lat. 31°05' North; Long. 75°50' East), about 9 km north-east of Phillaur, District Jalandhar, Punjab, in a 5 m cultural deposit, a three-fold sequence of cultures was identified. Of these, the lowest Period I is represented by Painted Grey Ware culture which has a sprinkling of late Harappan sturdy red ware in it indicating again interlocking of two cultures.

Two oval structures of burnt earth probably of religious character have been found in the levels of this period. People were living in semi-circular huts adjacent to these structures as attested by the discovery of post holes (pl. LXXVII). Copper objects, bone styli, terracotta ear-ornaments, animal figures have been found, besides beads and bangles (pl. LXXVIII A).

Period II is represented by the typical Kushan pottery, terracottas and coins. At the end of this period there is a little early Gupta deposit which is very much disturbed by the medieval pits. A significant discovery from this deposit is a terracotta seal (pl. LXXVIII B) with the legend *Shri Maha Senapati Ramguptasya* in second-third century Brahmi characters¹⁰. Besides six floor levels, no other structures of this period are available in the present small scale excavation.

In Period III, there was prosperous habitation at Nagar representing the early medieval times. Mud brick walls of a house complex belonging to this period have been exposed (pl. LXXIX). Beads of terracotta, semi-precious stone and glass and terracotta animal figurines are other finds. A figure of a terracotta horse adds to the list of impressive finds.

5. EXCAVATION AT KATPALON, DISTRICT JALANDHAR, PUNJAB

Excavation at Katpalon (Lat. 31°05' N; Long. 75°52' E), 7 km east of Phillaur, District Jalandhar, brought to light a sequence of three cultures in a deposit of 6 m. In Period I, Painted Grey Ware Culture has been found interlocked with late Harappan Culture. An oval structure, in a dilapidated, condition has been found. Associated with this period. Other finds include copper antimony rods, terracotta beads and wheels, Painted Grey Ware, Late Harappan Ware and incised ware¹¹. This period, after a break was followed by Kushan occupation (Period II) represented by typical Kushan pottery, beads and animal figurines (pl. LXXX).

¹⁰ Based on the readings made by Dr. B. Ch. Chhabra and Miss Madhu Bala.

¹¹ K.N. Dikshit, 'Exploration along the Right Bank of River Satluj in Punjab', *Journal of Indian History*, Vol. LLV, Part-II, 134 (August, 1967), pl. II, pp. 564-565.

In Period III, the strata is very much disturbed by medieval pits and it is represented by medieval pottery, terrcottas and beads. On the top, the entire site is very much disturbed by modern graves and pits.

APPENDIX - I

LIST OF EXPLORED SITES

PH = Pre-Harappan; H = Harappan; LH = Late Harappan; PGW = Painted Grey Ware; BW = Black Ware; GW = Grey Ware; EH = Early Historical and MED = Medieval

<i>S.No.</i>	<i>District</i>	<i>Village/Site</i>	<i>Cultural Assemblage</i>
1	2	3	4
HARYANA			
1.	Fatehabad	Dhani Chart Sing	EH, MED
2.	„	Ratta Tibba	PGW, RW, EH
3.	Hissar	Ali Kainda	EH
4.	Sirsa	Rorki	EH
JAMMU AND KASHMIR			
5.	Baramulla	Deolkampura	NEOLITHIC
6.	„	Kingadara	„
7.	„	Kanispura	„
8.	Jammu	Chak Jafar	EH
9.	„	Chak Kanal	EH
PUNJAB			
10.	Amritsar	Attari	MED
11.	„	Buraihan	PGW, GW
12.	„	Chhina	LH, PGW, GW, BW
13.	„	Charinda Devi	GW, BW, MED
14.	„	Dhonderi	EH
15.	„	Gharinda	LH, PGW, GW, BW, MED
16.	„	Ghoga Nangal	GW, EH
17.	„	Gujranwala	EH
18.	„	Her	RW, GW
19.	„	Kals Teh Patti	EH, MED
20.	„	Khabbe Dogar	EH
21.	„	Khemkaran	EH
22.	„	Lacchman Yati Di Marhi	GW, BW, EH, MED

1	2	3	4
23.	Amritsar	Mehdipur	EH, MED
24.	„	Neshta	MED
25.	„	Noordi I	EH
26.	„	Noordi II	EH
27.	„	Palla	MED
28.	„	Pucca Pind	MED
29.	„	Ramthirth	GW, EH, MED
30.	„	Ratak	EH
31.	„	Shahjra	EH
32.	„	Tharoh	EH
33.	„	Vadala	EH
34.	„	Vadalan	EH
35.	„	Vadala (Gruanthian)	PGW, GW, BW, MED
36.	Faridkot	Abohar	MED
37.	„	Bachan Singh da Theh	EH
38.	„	Bhai Singh Da Theh	EH
39.	„	Chak Mamsa	EH
40.	„	Chak Navan	EH
41.	„	Dabwal Theh	LH
42.	„	Harike Sunewala	EH
43.	„	Harike 1 & 2	EH, MED
44.	„	Harinan Theh	EH, MED
45.	„	Himmat pura (Jaingan Wala Theh)	EH, MED
46.	„	Innewala Theh	PH, H, EH, MED
47.	„	Kala Theh	EH
48.	„	Kamanwali Theh	EH, MED
49.	„	Karowal	EH
50.	„	Madrassa	EH
51.	„	Maur Harino Theh	EH
52.	„	Sarai Naga-1	GW, BW, EH
53.	„	Sarai Naga-2	EH
54.	„	Sosan	LH, BW, GW, PGW, EH
55.	„	Tehna	EH
56.	„	Ther Bhai Bhag Singh	EH, MED
57.	Ferozpur	Arniwala	PH, H, EH
58.	„	Kanewal	EH

APPENDICES

1	2	3	4
59.	Ferozpur	Lakhewali	EH
60.	„	Pakan Havalian	EH
61.	„	Sarianwala Brar Theh	EH, MED
62.	„	Siriwala	EH
63.	„	Urang	EH
64.	Gurdaspur	Barauni	GW, MED
65.	„	Budhenangal	GW
66.	„	Bukhariwal	GW, MED
67.	„	Dodwan	LH, GW
68.	„	Gagar Bhana	MED
69.	„	Gurdas Nangal Da Theh	LH, GW
70.	„	Haripur	LH, GW, MED
71.	„	Hardo Rawal	GW, RW, MED
72.	„	Hazipur	LH, MED
73.	„	Jagaria	LH, GW
74.	„	Kalanaur	GW, MED
75.	„	Kanva	LH, GW, BW, MED
76.	„	Log garh	LH, GW
77.	„	Mahatpur	LH, EH
78.	„	Neevan Dhakla	EH
79.	„	Painar	MED
80.	„	Sanamepur Rajan	GW, MED
81.	Hoshiarpur	Akam	EH, MED
82.	„	Achal Sahib	GW, RW, MED
83.	„	Bijwada	MED
84.	„	Buladda	EH
85.	„	Dasuya	MED
86.	„	Gagar Bhana	MED
87.	„	Galarian	LH, EH, MED
88.	„	Kila Mukerian	EH, MED
89.	„	Maitpur	LH, EH, MED
90.	„	Ram Colony Camp	EH
91.	„	Sham Chaurasi	EH, MED
92.	„	Shahpur Kandi	EH, MED
93.	„	Tanda	EH
94.	„	Teh	EH
95.	„	Zahoora	EH, MED
96.	Jalandhar	Apara	GW, BW, EH

1	2	3	4
97.	Jalandhar	Bhatnoorak Kalan	H. GW
98.	„	Bilauni	EH
99.	„	Chini Kanjri Da Theh	PGW, GW, BW
100.	„	Buriahah	GW, EH
101.	„	Dalla	MED
102.	„	Dhunderi	EH
103.	„	Haripur	LH, PGW, GW
104.	„	Kali Bain	EH
105.	„	Kalwalkota	EH, MED
106.	„	Karalan	LH, GW, BW
107.	„	Kartarpur	PGW, GW
108.	„	Malsian	LH, GW, BW
109.	„	Mausab	EH
110.	„	Nauli	LH
111.	„	Rahon	LH, EH, MED
112.	„	Rajgarh	LH, PGW, GW
113.	„	Saprod Nangal	EH
114.	„	Singapura	GW, EH
115.	„	Talwan	MED
116.	„	Uccha Lutera	PGW, GW
117.	Kapurthala	Alampur	MED
118.	„	Ambowal	EH
119.	„	Begowal	MED
120.	„	Bhatnura Kalan	LH, GW
121.	„	Bila	GW, EH
122.	„	Ghoga	GW, EH
123.	„	Gidana	EH, MED
124.	„	Guru Sahib Da Talab	MED
125.	„	Hamira	LH, GW
126.	„	Hamora	GW, EH
127.	„	Hezma	EH
128.	„	Kala	GW
129.	„	Kalwal Kota	EH, MED
130.	„	Khakram	EH, MED
131.	„	Khakhrain	EH
132.	„	Lakhan Keh	LH, GW, EH
133.	„	Maim	MED

APPENDICES

1	2	3	4
134.	Kapurthala	Muddowal	EH
135.	„	Narkat	EH, MED
136.	„	Parvez Nagar	EH
137.	„	Ratta Theh.	EH, MED
138.	„	Raiwala	EH, MED
139.	„	Rianwala	EH, MED
140.	„	Roda Theh	EH
141.	„	Shekhopur	MED
142.	„	Singapura	LH, GW, BW
143.	Mansa	Akkah Wali 1 & 2	EH, H, MED
144.	„	Alika	LH
145.	„	Alika Da Tibba	LH, EH, MED
146.	„	Arniwala	EH
147.	„	Baglian Da Theh	PH, H
148.	„	Baye 2	LH
149.	„	Beeranwala Theh	EH
150.	„	Bhairupa	EH
151.	„	Bhikhi	LH
152.	„	Bremi	EH
153.	„	Dabbewala Teh.	LH
154.	„	Dairh Bagge Wali	EH, MED
155.	„	Damdama Sahib	EH
156.	„	Dallewala-1	H
157.	„	Dallewala-2	H
158.	„	Danewala-1	LH
159.	„	Danewala-2	LH
160.	„	Dasundi	EH
161.	„	Falta Malluka	EH
162.	„	Fokal	EH
163.	„	Garhiwala	EH
164.	„	Guna Khurad	EH
165.	„	Gurni Kalan-2	PH, H, PGW, BW
166.	„	Gurni Kalan-1	PH, H
167.	„	Hasanpur-1	EH
168.	„	Hasanpur-2	PH, H
169.	„	Hirke	H, LH
170.	„	Jarianwala	EH
171.	„	Jassalwal	EH

1	2	3	4
172.	Mansa	Jassi Pan Wala	EH, MED
173.	„	Jodhpur Da Theh	EH
174.	„	Karanpura	H
175.	„	Kasampura 1 & 2	EH
176.	„	Khaidera Ram Dittawala	EH
177.	„	Kotrewala	EH
178.	„	Kusala Da Theh	EH
179.	„	Lakhmir Wala	PH, H
180.	„	Lekhanwala Theh	EH
181.	„	Mallowali	EH, MED
182.	„	Mandali 1, 2, 3, 4	EH
183.	„	Mandra	EH
184.	„	Nangal	EH
185.	„	Narhi Wala	LH
186.	„	Nai Wala 1, 2, 3, 4, 5	PH, H
187.	„	Nahriwala Theh	LH, EH
188.	„	Peron	PH
189.	„	Phool	PH
190.	„	Raj Rana	EH
191.	„	Rori	EH
192.	„	Sahnewali	LH
193.	„	Sanewali	EH
194.	„	Satiwala Khuh	EH
195.	„	Saundian 1 & 2	EH
196.	„	Swawala Tibba	EH
197.	„	Tehna	EH
198.	„	Ullak Kaichian	EH
199.	Patiala	Raj garh	LH, PGW, GW
200.	Sangrur	Bar Khundi	EH
201.	„	Bhanuwala	EH
202.	„	Dhilwan	EH
203.	„	Harnarian Singh Da Theh	EH
204.	„	Hattor	EH
205.	„	Kailon Wala	
206.	„	Khudi Derwala Theh	EH, MED
207.	„	Liluwala Theh	EH
208.	„	Ruda Khurd Theh	EH
209.	„	Sehna Theh	EH

APPENDIX - II

**SOME IMPORTANT PROTOHISTORIC
SETTLEMENTS IN MANSA DISTRICT, PUNJAB**

<i>S.No. Name of the site</i>	<i>Lat.</i>	<i>Long.</i>	<i>Area</i>	<i>Cultural assemblage</i>	<i>Village/ Town/City</i>	<i>Group</i>
1. Alike	75°20' N	29°45' E	200 × 200	Late Harappan	Village	C
2. Danewala-1	75°20' N	29°49' E	200 × 200	Late Harappan	Village	C
3. Danewala-2	75°20' N	29°49' E	200 × 200	Late Harappan	Village	C
4. Chhoti Mansa	75°05' N	30°13' E	200 × 200	Pre-Harappan/Harappan	Village	C
				Late Harappan		
5. Lalianwali	75°20' N	29°50' E	200 × 200	Harappan	Village	C
6. Laluwala	75°20' N	29°51' E	200 × 200	Harappan	Village	C
7. Bhikhi	75°34' N	30°04' E	300 × 300	Late Harappan	Village	C
8. Gurni Kalan-2	75°30' N	30°00' E	400 × 400	Pre-Harappan/Harappan	Village	C
9. Nahriwala	75°25' N	30°05' E	400 × 400	Late Harappan	Village	C
10. Naiwala-1	75°30' N	29°55' E	400 × 400	Pre-Harappan/Harappan	Village	C
11. Naiwala-2	75°30' N	29°55' E	400 × 400	Pre-Harappan/Harappan	Village	C
12. Naiwala-3	75°30' N	29°55' E	400 × 400	Pre-Harappan/Harappan	Village	C
13. Naiwala-4	75°30' N	29°55' E	400 × 400	Pre-Harappan/Harappan	Village	C
14. Naiwala-5	75°30' N	29°55' E	400 × 400	Pre-Harappan/Harappan	Village	C
15. Dallewala-1	75°25' N	29°49' E	500 × 500	Harappan	Town	B
16. Hirke	75°23' N	29°44' E	500 × 500	Pre-Harappan/Harappan	Town	B
17. Karanpura	75°25' N	29°53' E	500 × 500	Harappan	Town	B
18. Dallewala-2	75°25' N	29°50' E	500 × 500	Harappan	Town	B
19. Bare-2	75°29' N	29°54' E	500 × 500	Late Harappan	Town	B
20. Sahnawali	75°30' N	29°55' E	500 × 500	Late Harappan	Town	B
21. Dhalewan	75°35' N	30°02' E	1500 × 1500	Pre-Harappan/Harappan	City	A
22. Gurni Kalan-1	75°32' N	30°00' E	1200 × 1200	Pre-Harappan/Harappan	City	A

<i>SNo. Name of the site</i>	<i>Lat.</i>	<i>Long.</i>	<i>Area</i>	<i>Cultural assemblage</i>	<i>Village/ Town/City</i>	<i>Group</i>
23. Hasanpur-2	75°30' N	29°58' E	1000 × 1000	Pre-Harappan/Harappan	City	A
24. Lakhmirwala	50°28' N	29°52' E	1500 × 1500	Pre-Harappan/Harappan	City	A
25. Baglian Da Theh	50°28' N	29°57' E	1000 × 1000	Pre-Harappan/Harappan	City	A

INDEX

A

Adibadri, 13
 Agni, 29
 Agrawal, 16
 Agrawal, D.P. and B.M. Pande, 15n, 229 n
 Agrawal, D.P. and A. Ghosh, 1n
 Agrawala, D.P. and R.K. Sood, 16n
 Agrawal, R.C. and Vijai Kumar, 2n
 Ahichchhatra, 1, 220, 237
 Ailusha, 6
 Aitken, Dr. M.J., 185n, 186, 193-194n, 196, 204, 206
 Aitken and S.G.C. Bowman, 180n
 Aitken, M.J., D.W. Zimmerman and S.J. Fleming, 186n
 Aitken, M.J. and S.J. Fleming, 185n, 192n
 Aitken, M.J. and V. Mejdahl, 194n, 196n
 Akhnoor, 7, 20, 23
 Alaknanda, 1
 Alamgirpur, 1, 24, 29, 53n, 127, 220
 Alike, 253
 Allahpur, 1
 Allchin, F.R., 15, 26, 26n
 Allchin, Bridget and F.R., 1n, 15n, 26n
 Ambala, 9, 21
 Amkheri, 45n, 53n, 57n, 70n, 72n
 Amritsar, 7, 21, 26, 230-231
 animal bones, 20; figurines 236; skeletal remains, 143-144, 146-147
 Ansari, Z.D. and M.K. Davlikar, 45n, 94n
 anthropomorphic figure, 18, 20, 23, 29, 126, 126n
 Anupgarh, 14
 Aparā, 7
 Apatite, 187

Arab geographer, 14

Arada, 14

Archaeological Survey of India (ASI), 1n, 3n, 4n, 5, 7, 9, 185, 190, 190n, 203, 227, 239

Arikamedu, 220

Arsenic, 223

Aryans, 5, 7, 12

Asand, 14

Asthana, S. 139n

Atranjikhhera, 2, 17, 23-25, 65n, 220

Attari, 7

axis axis erklaben, 144

Ayalki-Fatehbad, 13

B

Babain, 9

Babylon, 219

Baghan Da-Teh, 231, 234-235, 254

Baghdad, 219n

Bahadarabad, 17, 23-24, 45n, 65n, 72n, 82n, 94n

Bahar Jakh, 13

Bahawalpur, 1, 8, 232-233

Balambat, 29, 126n

Banawali, 13-14, 25, 45n

bangles of, clay, 241; terracotta, 23; copper, 20, 136; faience, 18-19, 23, 125-126, 234-36, 244; glass, 20, 219, 243; bone, 134

Bara, 23-25, 45, 45n, 47, 72n, 133, 241, 243-244; culture, 6, 25; type, 17, 23

Baramulla, 227, 229

Barans, 25, 233

Bare, 231, 234-235, 253

Bargaon, 45n

Baudhayana Sutra, 219

- Bavangadh, 13
- beads of, agate, 117-118, 120, 122; bone, 117, 120, 124; carnaliam, 117-118, 120, 244; chalcedony, 117; copper, 117-118, 120, 124; glass, 117-118, 124, 219; Jasper, 117-118, 120; crystal, 117-118; faience, 18-20, 23, 117-118, 120, 122, 124; lapis lazuli, 117, 122, 236; quartz, 117-118; semiprecious stones, 18, 23; shell, 117; serpentine, 117; steatite, 117-118, 120; terracotta, 117-118, 122, 124
- Beas, 16, 229, 231-232
- BARC, 25, 185, 185n, 203
- Bhagwanpura, 2, 7-9, 13-14, 17-18, 21, 21n, 23-27, 29, 31, 33, 39, 45, 47, 124, 127, 131, 139, 141, 143, 146-148, 155, 162-164, 185, 190, 196, 200, 201, 203, 209, 219, 219n, 220, 223, 225, 237, 239, 243-245
- Bharatpur, 233
- Bharat war, 6
- Bhardwaj, 16
- Bhardwaj, M.C., 219n, 220n
- Bhardwaj, O.P., 16n
- Bhargava, 13, 13n
- Bhargava, M.L., 12n
- Bhargava, V.K. 204
- Bhatinda, 233, 235
- Bhatinda-Patiala road, 233
- Bhikhi, 231, 233, 253
- Bhirrana, 13
- Bholanath, 147n
- Bhuladda, 236
- Bhuladda-Bhikhi road, 235
- Bikaner, 7
- Bikaner-Ganganagar, 230
- Bisht, R.S. 9, 3n
- black pottery, 214
- black ware, 7, 20-21, 45, 49, 113, 115-116, 239, 241, 244
- black and red ware, 21, 236-237
- black slipped ware, 236
- blades of, 235; semiprecious stones, 234; chert, 234, 241, 255
- bone objects, 133-134; ear-ornaments, 131; pins, 18, 20; points, 23, 148, 244; piercer-cum-scraper, 148; bangles, 136; styli, 19-20, 134; scraper, 148; tools, 148; arrowhead, 134, 241; needles, 20, 134
- bones of, cattle, 29, 148; sheep, 29
- Bos indicus*, 143-145
- Brahmagiri, 220
- Brahmi alphabets, 139; characters, 245
- Brill, Robert H., 220n
- bronze, 224
- Brothwell, D.R., 160n
- Bryson, 15
- Bryson, R.A. and A.M. Swain, 15n
- Bubalus bubalis*, 143-144
- Bulandshahar, 232
- buff ware, 51
- burnished grey ware, 20, 25, 45, 241, 243
- Burzahom, 146, 243

C

- Canis lupus*, 146
- Canis familliaris* Linn. 144-145
- Capra hircus aegagrus*, 143-145
- Carnalian pendant, 18
- Cemetery 'H' culture, 6, 17, 23, 25, 45, 47, 233, 241, 243-244
- Chandigarh, 45n
- Chandraketugarh, 220
- Chandra, Lokesh, 5n
- Chandra, Lokesh, S.P. Gupta, D. Swarup and S. Goel, 26n
- Chaturvedi, R., 218
- Chawdhury, 15
- Chhabra, B. Ch. and Madhu Bala, 245n
- Chhoti Mansa, 231, 253

INDEX

Chenab, 229, 237

Chloride, 223

Cholistan, 1, 8

Chinikanjrika ther, 7

Chuharpur, 13

Cobalt, 223

Coins, 239

Copper, 19, 27, 224, 244; bangles, 20; borer, 136; spikes, 136; antimony rod, 18, 20, 136, 243; pins, 18, 23; ring, 244; coil, 136; coins, 243; nail-pair, 136; needle, 136; dagger, 136

Copper-bronze age, 15

Copper-Hoard, 6, 8, 233

Corn-grinder, 18, 27

Courty, M.A., 15n, 16, 16n

Courty, M.A. and Fedorff, 15

Cunningham, A., 13

D

Dadheri, 2, 7, 21, 21n, 23-25, 239, 244

Dales, G.F. and J.M. Kenoyer, 94n

Dallewala, 231, 253

Dani, A.H., 20n, 29n, 126n

Dark Age, 7

Daulatpur, 2, 17, 23-24, 45n

David, M., 204

Denewala, 231, 253

Deo, S.B., 219n

Derawar, 14, 232

Deshpande, M.N. and K.N. Dikshit, 45n, 70n

Dhalewan, 231, 233-235, 253

Dharsul-Kullan, 13

Didwana, 15

Dikshit, K.N., 1n, 2n, 18n, 45n, 70n, 232, 245n

Dixit, M.G., 220n

Doab, 26

Dodwan, 7

Domeli, 45n, 62n

Drishadvati, 2, 8, 14, 233

Durrani, F.A., 15

Dyson, 15

E

Egypt, 219

Ellenabad, 13

Equus caballus, 144-145

Equus asinus, 144

F

Falji, 14

faience, 236; bangles, 18-19, 125-126, 234-236, 244; beads, 18-20; bracelet, 125; *kangan*, 125-126; objects, 21

Fairservice, W.A., 15

Faridkot, 230

Feldspar, 186-187

Ferozpur, 7, 21, 230

Firuz Shah Tughlaq, 13

Fleming, S.J., 186, 191

Francfort, H.B., 219n

Frank, Susan, 219n

G

Gandhara Grave Culture, 20, 29, 126n

Ganga, 8, 233

Ganga Civilization, 24

Ganganagar, 231, 241

Ganguly, Dr. A.K., 203

Garhi Radam, 7

Gaur, R.C., 2n, 25
 Ghaggar, 8, 13-14, 16, 229-233
 Ghaggar-Hakra, 231
 Ghaggar-Sarasvati, 233
 Gharinda, 1, 7
 Ghosh, A., 1, 5, 7-8, 14-16, 33n, 139n
 Ghosh, A. and K.G. Panigrahi, 1n
 Ghosh, R.N., 15
 Giovanni Mariacher, 219n
 glass objects, 21, 125, 219-220, 245
 glazed ware, 245
 Goose, D.H., 160
 Govindgarh, 244
 graffiti, 21, 24, 47, 139, 141
 Grey Ware, 1, 7-9, 17-21, 23, 25-26, 29, 36, 43, 45, 47, 49, 51, 53, 96, 98-99, 101-103, 105, 107-109, 111-113, 139, 190, 199, 203, 218, 227, 229-230, 236, 239, 241, 243-244; Culture, 213; settlement, 229n
 grinding corn, 36; tools, 29
 Gufkral, 146
 Gujarat, 227, 232
 Gupta deposits, 245; period, 6
 Gupta, S.P., 45n
 Gupta, S.P. and K.S. Ramachandran, 2n
 Gupta, S.P., D. Swarup and S.R. Goel, 5n
 Gurdaspur, 7, 20, 227
 Gurdas Nangal Da Theh, 7
 Gurna or Rohi, 236
 Gurnikalan, 231, 235-236, 253

H

Hakra, 14
 Haertel, Herbert, 2n
 Hanumangarh, 13
 Harappa, 1, 65n, 146, 232, 234, 239

Harappan, 5, 13-14, 21, 23, 231-232, 253-354; affiliation, 2n; complex, 24; culture, 2, 5-6, 25, 219, 235; occupation, 21; pottery, 17, 33; tradition, 18-19, 27; settlements, 229n, 232, signs, 141; script, 139; sites, 146, 235; ware, 227, 229-230, 234-235, 241, 243
 Harded Rawal Khurd, 7
 Haripur, 7
 Haryana, 1, 6-9, 20, 25-26, 185, 227, 229-232, 237, 239, 241, 243
 Hasanpur, 231, 236, 254
 Hasan, S. Jamal, 49n
 Hastinapur, 1-2, 7, 24, 132n, 220
 Himalayas, 13, 16, 229, 232
 Himalayan, 14
 Hindon, 232
 Hirke, 231, 253
 Holocene, 16
 Hoshiarpur, 230-231
 Hulas, 2, 23-24, 45n, 53n, 133
 Human burials, child, 149, 151, 155-160; adult, 151-153, 160-163

I

incised bioconical beads, 20; potsherds, 139; pottery, 244; tablets, 139; ware, 17, 245
 India, 5-6, 8, 163, 219, 227
 Indian Culture, 5; society, 6
 Indo-Aryans, 7, 26
 Indo-French Archaeological Expedition, 16
 Indo-Gangetic, 227
 Indo-Pakistan, 7
 Indus, 14, 24, 237; Valley Civilization, 203, 233; urbanism, 25
 ivory objects, 20, 133, 136; pendants, 237

J

Jakhra, 2, 127

INDEX

Jalandhar, 7, 21, 23, 230, 239, 245
Jammu, 5, 7-8, 23, 25-26, 229, 237, 243
Jammu and Kashmir, 1, 7, 227, 229, 230, 237
Jamuna, 232
Jhinhina, 25
Jind, 14
Jodhpur, 2, 132n
Johyanallah, 13-14
Jokhka, 13
Joshi, J.P., 2n, 5n, 24, 26n, 190n, 203, 227n, 232n, 237n
Joshi, J.P. and Asko Parpola, 139n
Joshi, J.P. and Madhu Bala, 1n, 2n, 27n, 237n

K

Kalibangan, 13-14, 17, 24-25, 47, 94n, 146, 232, 234, 239, 241, 241n, 243
Kamal, A.R., 204
Kanotra, Y.K., 218, 224
Kanwa, 7
Kapalmochan, 13
Kapurthala, 230
Karanal, 7
Karampura, 231, 253
Kartarpura, 7
Kashmir, 227; Valley, 243
Kasital, 14, 237
Kathua, 229
Katpalon, 2, 7, 21, 21n, 23, 239, 245
Katgadhi, 13
Katyayana Sruta Sutra, 13n
Kausambi, 220
Kawali-Chachur road, 235
Kayatha, 94n
Khanduri, B.M., 4n
Khatri, D.T., 204

Kolhapur, 9
Kondapur, 220
Kopia, 220
Kapoor, Sunil, 218
Kori Creek, 14
Kot-Diji, 234
Krishni, 232
Kunal, 13-14
Kurukshetra, 7, 9, 13, 17, 21, 185, 220, 227, 229, 237, 239, 244
Kuru-Panchala, 6-7
Kushan, coins, 245; period, 239, 243; pottery, 236, 241, 245
Kutch, 232

L

Ladwa, 9
Lakhiyopir, 1
Lakhmirwala, 235, 237, 254
Lahiwala, 231, 253
Lal, B.B., 1-2n, 5n, 7, 23, 25n, 47n, 139n, 147n, 220n, 237n
Lal, B.B. and S.C. Malik, 237n
Lal, B.B. and S.P. Gupta, 8n, 16n, 45n
Lal Qila, 25, 65n
Lallianwali, 231, 253
Late Harappan, 6-7, 9, 14, 18, 20-21, 23, 25-27, 45, 47, 94, 149, 231, 236, 239, 243-245, 253; affinity, 35; assemblage, 33; ceramics, 17, 24; contacts, 21, 127; culture, 17, 21, 23, 143, 203; fabrics, 36; pottery, 18-19, 33-37, 39, 43, 45n; shapes, 20, 29; settlements, 229n, 233; sites, 233; ware, 7-8, 21, 227, 229-230, 234
Leshnik, 15
Leshni, L.S., 15
Lessemus punctata, 144
Lohagarh, 7
Lothal, 146

Lucas, J.R., 159, 219n
 Ludhiana, 7, 21, 23, 230-231, 239, 244
 Lunkaransar, 15

M

Madhu Bala, 1n, 8n, 21n, 25n, 33n, 47n, 229n
 Madhyadesha, 26
 Madhya Pradesh, 1, 7, 227
 Mahabharata, 2, 6-7, 13-14, 227
 Mahadevan, I., 139n
 Mahorana, 45, 47, 57n, 62n, 90n, 94n
 Maheshwar, 220
 Majumdar, R.C. and A.D. Pusalkar, 219n
 Makorar, 13
 Malsian, 7
 Malwan, 146
Manava Srauta Sutra, 219
 Manda, 7, 20-21, 23, 25-26, 229, 232, 237, 239, 243-244
 Maujgarh, 14
 Mansa, 227, 230-236
Manusmriti, 13n
 Marcheri, 9
 Markanda, 229
 Marshall, Sir John, 14
 Maski, 220
 Mathura, 2, 29
 Mediterraneans, 21, 163
 Meher Homji, V.M., 15
 Mejdahl, V., 193n
 Mesopotamia, 21
 Mihran, 14
 Mishra, 16
 Misra, S.C., 204
 Mishra, V.N., 16n
 Mitathal, 17, 24, 45n, 70n

Mitra, D., 2n
 Mohanjo daro, 49n, 146
 mother goddess, 20, 29, 126
 modern graves, 246
 Moorrees, 159
 More, G.W., 219n
 Mughalawali, 13
 Mughal, M.R., 1n, 8, 232

N

Nagar, 1-2, 21, 23, 239, 245
 Nagda, 220
 Nagta, P.K., 218, 222, 224
 Nahriwala, 231, 253
 Naiwala, 231, 253
 Naiwala Theh, 235
 Nalanda, 220
 Nambi, Dr. K.S.V., 25
 Nambi, K.S.V., R. Sasidharan and S.D. Soman, 25n
 Nara, 14
 Narendrapur, 234
 Nasirpur, 25
 Nautiyal, K.P., 1n
 Nautiyal K.P., B.M. Khanduri, Vinod Nautiyal, D. R. Rajput and R.K. Bhat, 1n, 127n
 neolithic, 146
 Nevasa, 220
 Noh, 2, 127
 Northern Black Polished Ware (NBPW), 15

O

Ochre coloured ware (OCP), 8, 17, 23, 25, 233
 Oldham, C.F., 16
 Otu, 14

INDEX

oval structure, 19, 29, 39, 41, 43, 244-245

Ovis vigneiblyth, 144

Oxford, 185, 196, 204

P

Painted Grey Ware (PGW), 1-2, 2n, 5-6, 14, 18-19, 23, 25, 33-37, 43, 45, 47, 49, 139, 149, 231, 236-237, 239, 241, 244-245; culture, 15, 17, 21, 24, 26-27, 143, 219, 227, 229, 230, 232-233; deposits, 20; levels, 29, 127; people, 8; remains, 13; settlements, 229n; sherds, 132; sites, 7, 118

Pakistan, 1, 8, 20, 29, 126n, 231

Panchavimsa Brahmana, 13

Pande, B.M. and B.D. Chattopadhyaya, 5n, 26n, 45n, 90n, 94n

Pande, Mirdul, 218, 222

Panditon Ka-Tila, 14

Panis, 12

Paramasivam, S., 185n, 203

Parameswaran, M., 204

Parpola, Asko, 26n

Pataliputra, 220

Patiala, 230-231

Parvatas, 12

Pehoa, 13-14

Peter Francis, Jr., 219n

Peirie, 219n

Piggott, 14, 241n

Pipli, 7, 13

Pir Panjal Pange, 237

Plagioclasse, 186-187

Pliny, 219

Polynological studies, 15

Possehl, G.L., 16n, 45n, 232n, 237n

Prabhasa, 13

pre-Harappan, 13-14, 45, 94n, 231-232, 236, 239, 253-254; lineage, 17, 23; ceramics, 24; pottery, 47, 243; levels, 25; settlements, 229n, 233; ware, 227, 229-230, 234, 241, 244; sites, 235

Punjab, 1-2, 5, 7-8, 25-26, 227, 229-233, 239, 241, 243-245

Puromajra, 13

Pushkar, 15

R

Raikes, R.L., 15-16

Raikes, R.L. and R.H. Dyson, 15n

Raja Gulab Singh, 243

Raja Karan ka Qila, 2, 14, 17, 23-24

Rajasthan, 1-2, 8, 15, 49, 227, 230, 232-233

Rakhigarhi, 14

Ramnagar, 13

Rampur-Hedian, 13

Rangamahar, 13-15, 234-236

Rangoi, 14

Rangpur, 146

Ranjitpur, 13

Rann of Kutch, 14

Rao, N.K., 186n

Ravi, 229, 231-232

red ware, 7, 9, 17, 19-20, 23, 25, 45, 47, 49, 51-53, 55, 57, 60, 62-63, 65-67, 69-70, 72, 74, 76-79, 81-82, 84-85, 87, 89-90, 92, 94-96, 141, 149, 190, 199, 203, 215, 218, 231, 237, 239, 241, 243-245

reserved slipped ware, 241

Rigveda, 12, 14, 16, 26

Rigvedic Aryans, 12, 26

Ropar, 2, 5, 16, 220, 229-232

Roy, S.B., 5n

Rudrakoti, 13

S

- Sadasivan, Dr. S., 204
 Sadar Ahli, 13
 Shaffer, Jim G., 16
 Sagra, 13
 Saharanpur, 232
 Sahi, M.D.N., 2n
 Sahnewali, 231, 253
 Samant, R.K., P.V. Kumar, D.T. Khatri and K.S.V. Nambi, 189n
 Sambar, 15
Samhita, 26
 Sanghol, 2, 23, 62n, 133
 Sangrur, 230
 Sankalia, H.D., 26n
 Sarasvati, 2, 6, 8-9, 13-16, 27, 33-35, 39, 229, 233, 237
 Saraswati, Swami Vidyanand, 33n
 Sasidharan, Dr. R., 25
 Sasidharan, R., K.S.V. Nambi and R. Parthasarthy, 185n
 Sasidharan, R., Sunta and K.S.V. Nambi, 192n
Satapatha Brahmana, 21, 33n, 219
 Sutej, 14, 16, 21, 229, 231-232
 Satwadi, 8
 Sharma, A.K., 19n, 29, 146-147n
 Sharma, M.M., 43
 Sharma, R.S., 5n, 7, 8n, 26n
 Sharma, R.K., 25n
 Sharma, Y.D., 25, 45n
 Sharma, Y.D. and G.B. Sharma, 25n, 45n
 Sheesh Mahal, 237, 239, 243
 Shell, bangles, 234; pieces, 235; beads, 236
 Sidon, 219
 Sind, 1
Sindhudmata, 12
 Singh, Bhagwan, 45n
 Singh, *et. al.*, 15
 Singh, G., 14
 Singh, G., R.D. Joshi, S.K. Chopra and A.B. Singh, 14n
 Singh, R.N., 219n
 Singh, U.V., 5, 45n
 Singhvi, A.K. and D.W. Zimmernian, 186n
 Sinha, K.K., 2n
 Sircar, D.C., 6
 Sirhind, 230-232
 Sirhind *nalah*, 234
 Sirsa, 13-14
 Siswal, 17, 23-24, 94n
 Siwaliks, 13, 16, 229
 Soman, S.D., 25
 Somb, 13
 Sosan, 7
 Sotar Valley, 14
 spiral headed pins, 23, 243-244
 steatite disc beads, 234
 steatite beads, 236
 Stein, A., 14
 Sravasti, 1-2
 Sub-Himalayas, 1
 Sunam, 233
 Sunta, Dr. C.M., 204
 Suraj Bhan, 16, 45n
 Suraj Bhan and Jim G. Shaffer, 2n
 Suratgarh, 14
 Surkotada, 146
 Survey of India, 13
Sus scrofacristatus wagner, 144-145
 Swain, 15
 Swat Valley, 29
 Syrian, 219

T

Taittiriya Brahmana, 219

Taxila, 220

Tehri, 1

Tel Asmar, 219n

Tel-el Amarna, 219

terracotta, animal figurines, 19, 126-127, 129, 234-236, 245; art, 29; balls, 31, 129-130, 234; bangles, 18, 125, 234-236, 245; beads, 18-20, 234, 237, 244-245; beakers, 243; birds, 20, 127; bulls, 18, 23, 29, 127, 244; cakes, 25, 235-236, 241; toy cart frame, 132, 235, 241; *chakla*, 133; dabbers, 20, 129, 234; dogs, 20, 127, 129; ear-ornaments, 20, 131, 245; gamesman, 245; goblets, 243; hopscotch, 20, 31, 132; horse, 243, 245; human figurines, 126; lamps, 20; lumps, 43; rams, 20, 127; seal, 245; seated deity, 126; skin-rubber, 31, 130-131; spotted deer, 127; stopper, 130; wheel, 18, 20-21, 29, 131-132, 235, 244-245

Thanesar, 13

Thaper, B.K., 5n, 7, 15, 25n, 26n, 203

Thapli, 1, 127

T.L. Dates, 21, 23, 25, 185-194, 196, 199, 203-207, 219, 227

Tiwari, S.C. and S. Banerjee, 155n

Tandon, B.N., 124n

Turner, R.C., J.M. Radley and W.V. Mayneord, 189n

Turner, 219n

Tyse, 219

U

Ujjain, 1-2, 220

Ur, 219

Uttar Pradesh (U.P.), 1, 6, 8, 29, 227, 232-233

V

Vats, M.S., 70n

Vedic Age, 8; period, 26; sacrifice, 6

Vratas, 12

W

Wakankar, V.S., 2n

West Asian affinity, 241

Wheeler, R.E.M., 14, 239n

Y

Yamuna, 8, 13-14, 16, 231

Yashpal, 16, 229n

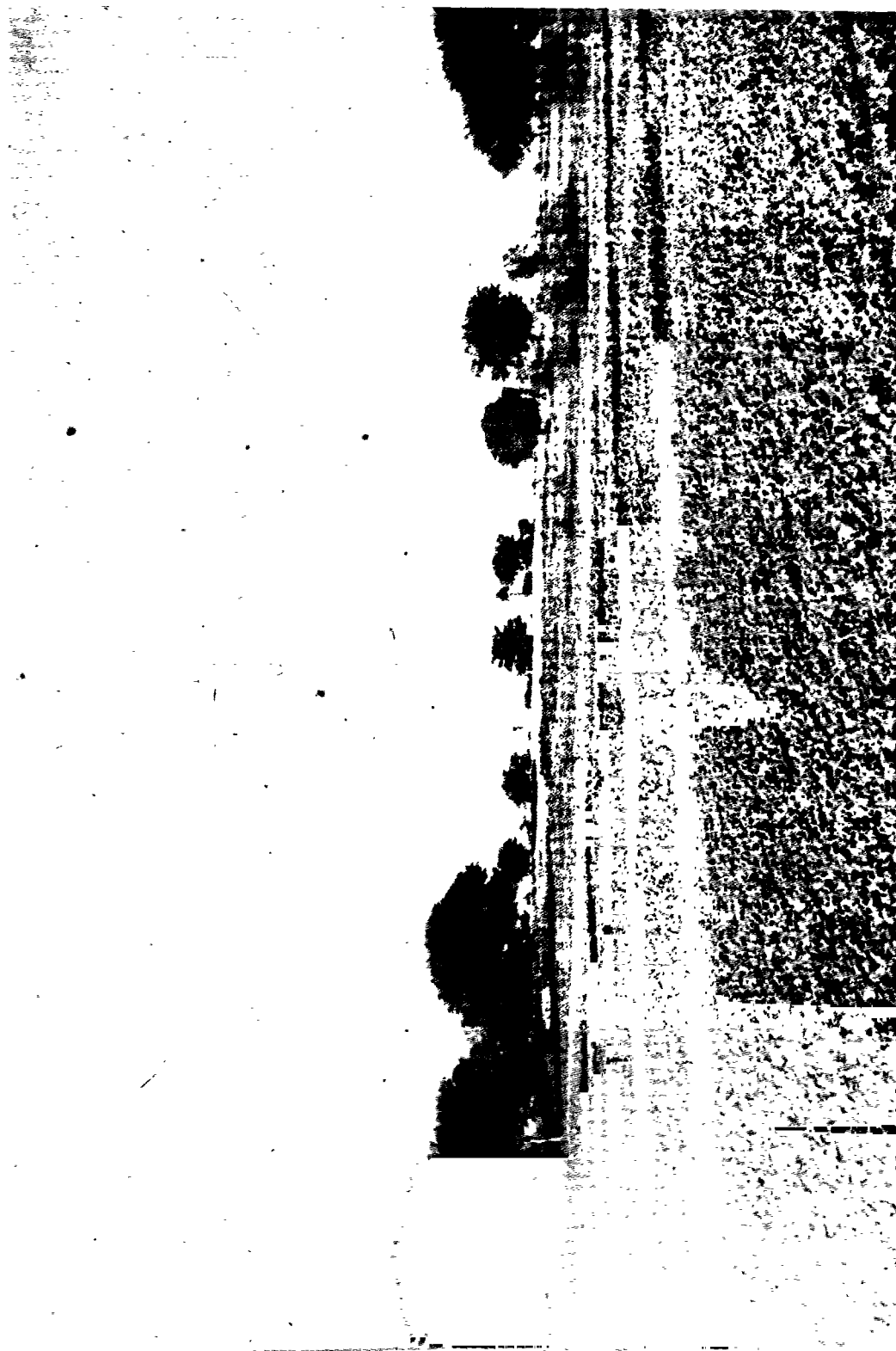
Yazman, 232

Z

Zimmerman, D.W., 191

zinc, 223

Zircon, 187



General view of the mound from east, before excavation. See p. 9



General view of the mound from west, before excavation. See p. 9



General view of the mound from south-west, before excavation. See p. 9



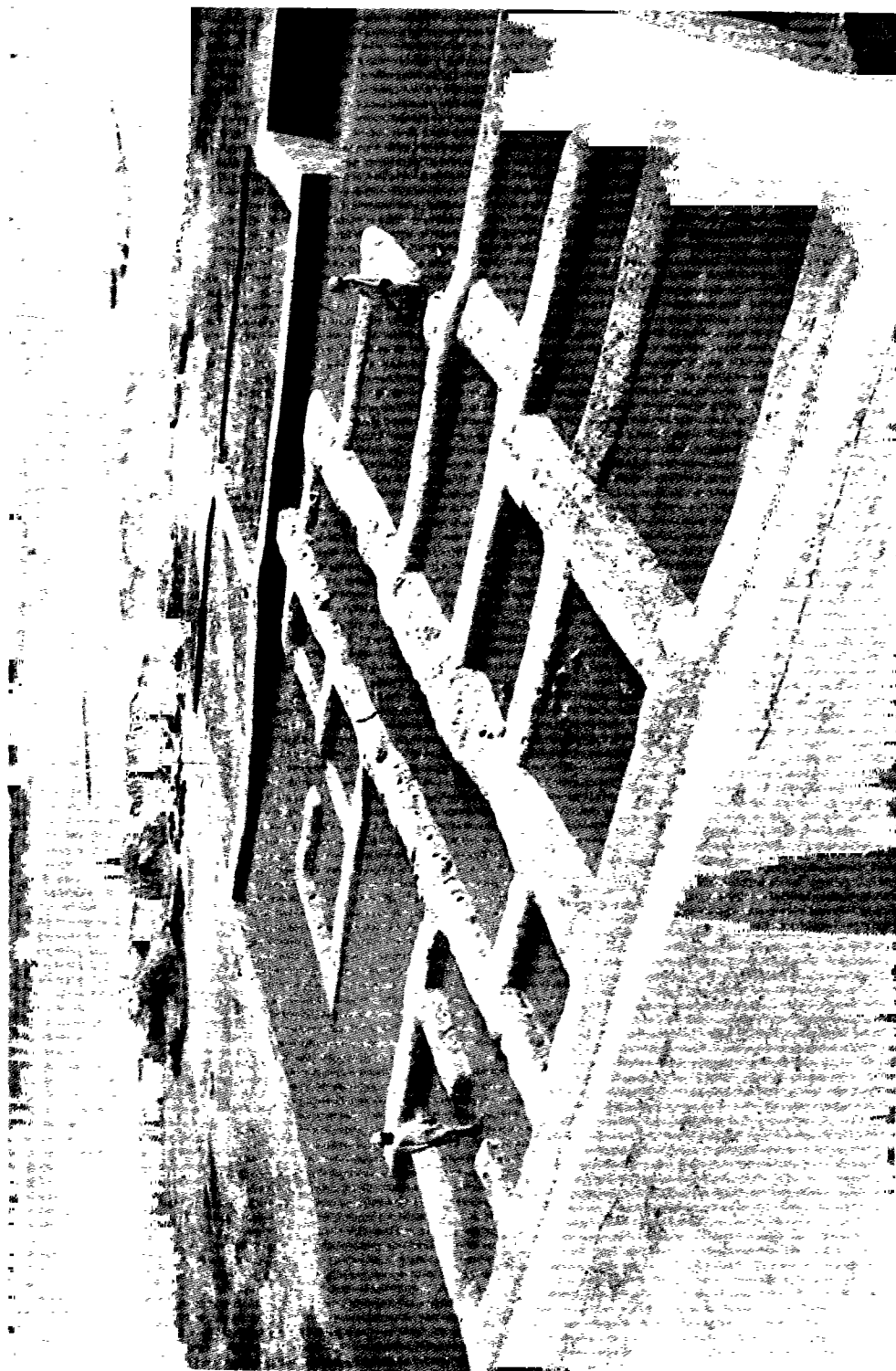
Section looking west, Trench D1, Qd. 2. See p. 33



Mud platform with a step, Sub-period IA. See p. 39



Post-holes and saddle querns in a circular hut, Sub-period IB, Phase 1. See p. 41



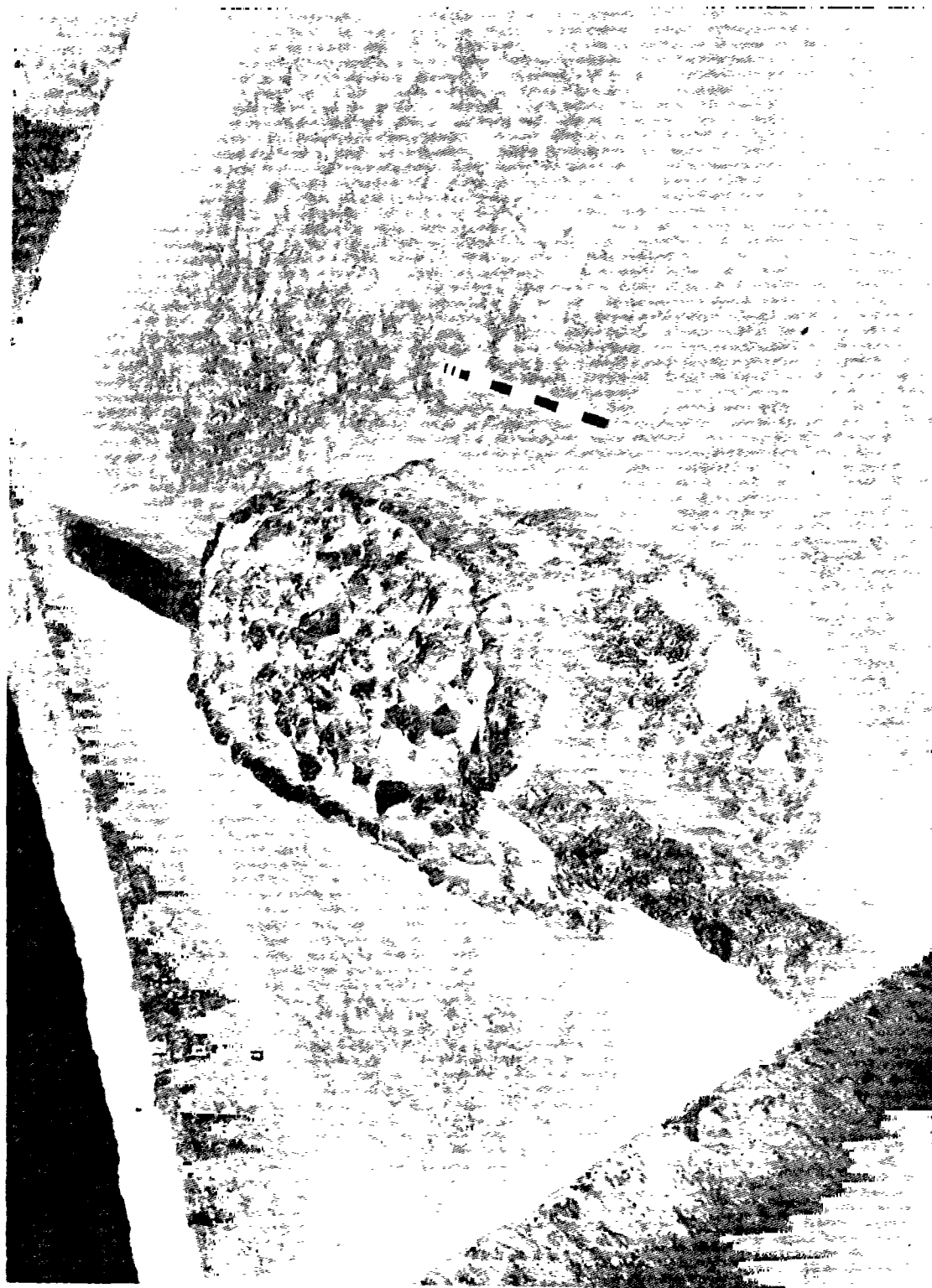
Mud house, Sub-period IB, Phase II. See p. 41



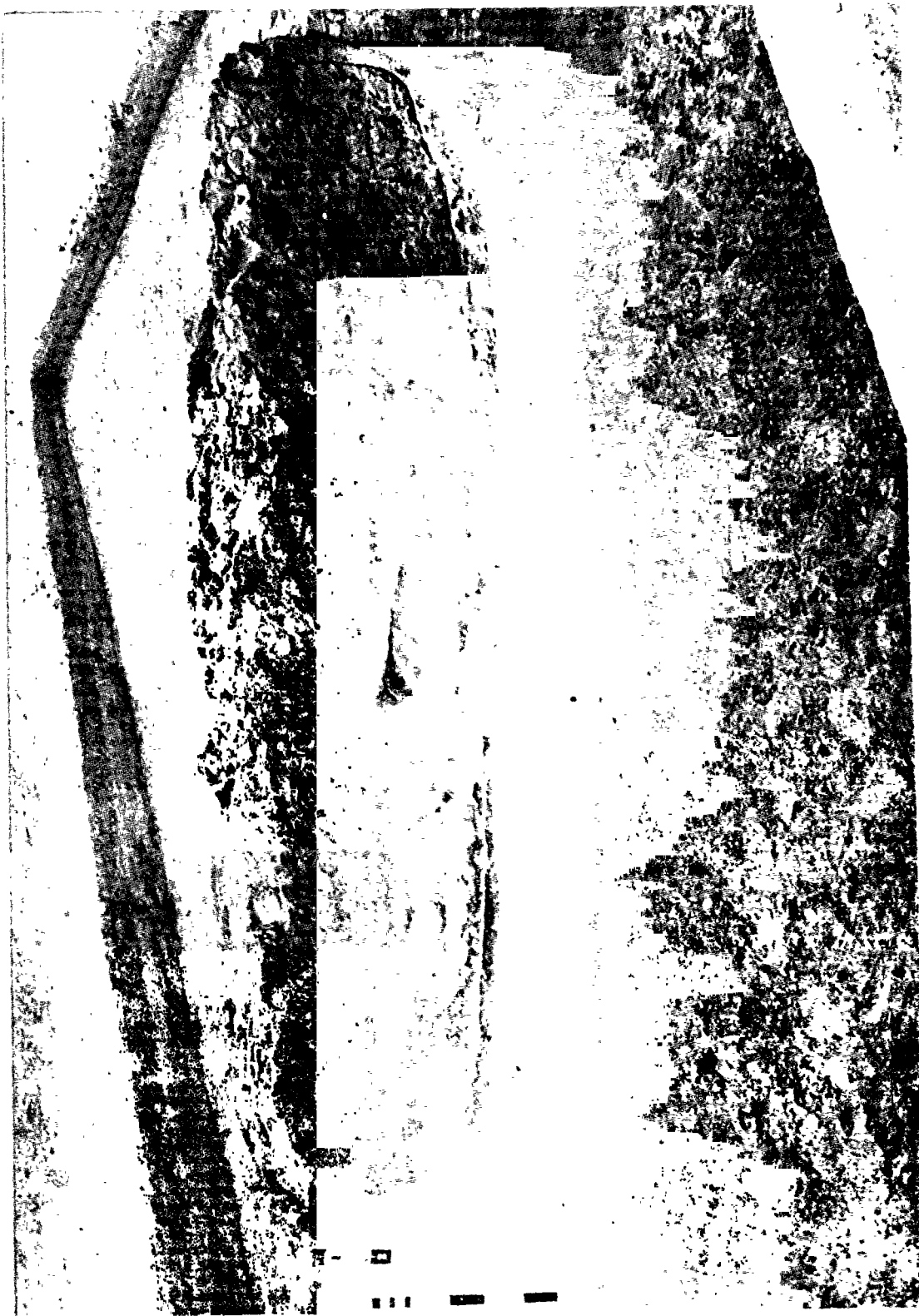
Cluster of burnt bricks of a disturbed structure, Sub-period IB, Phase III. See p. 41



Bricks of various sizes, Sub-period IB, Phase III. See p. 41



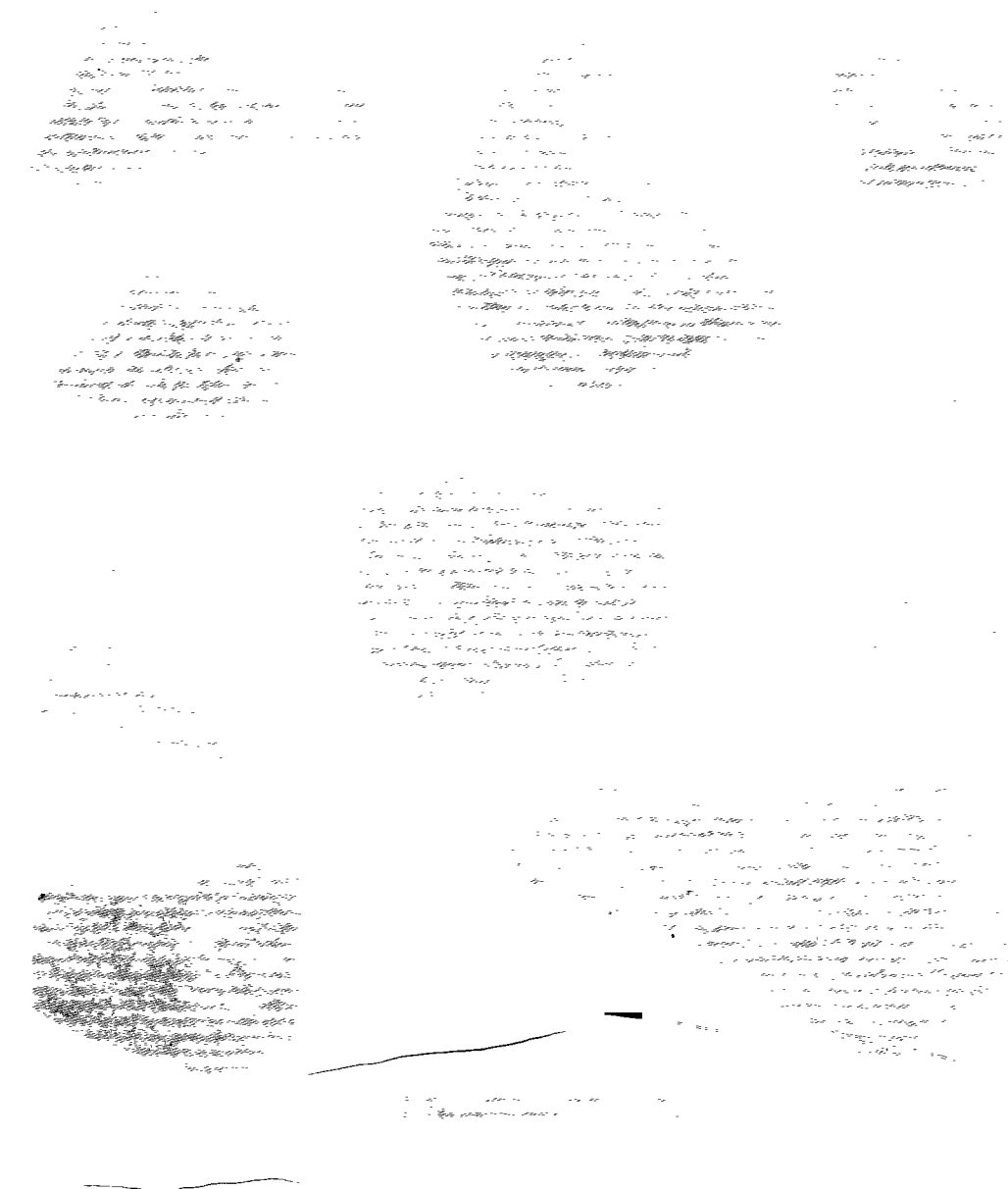
Oval structure no. IV having two phases of construction. See p. 43



Cross-section of an oval structure showing burnt material, Sub-period IB, Phase II. See p. 43



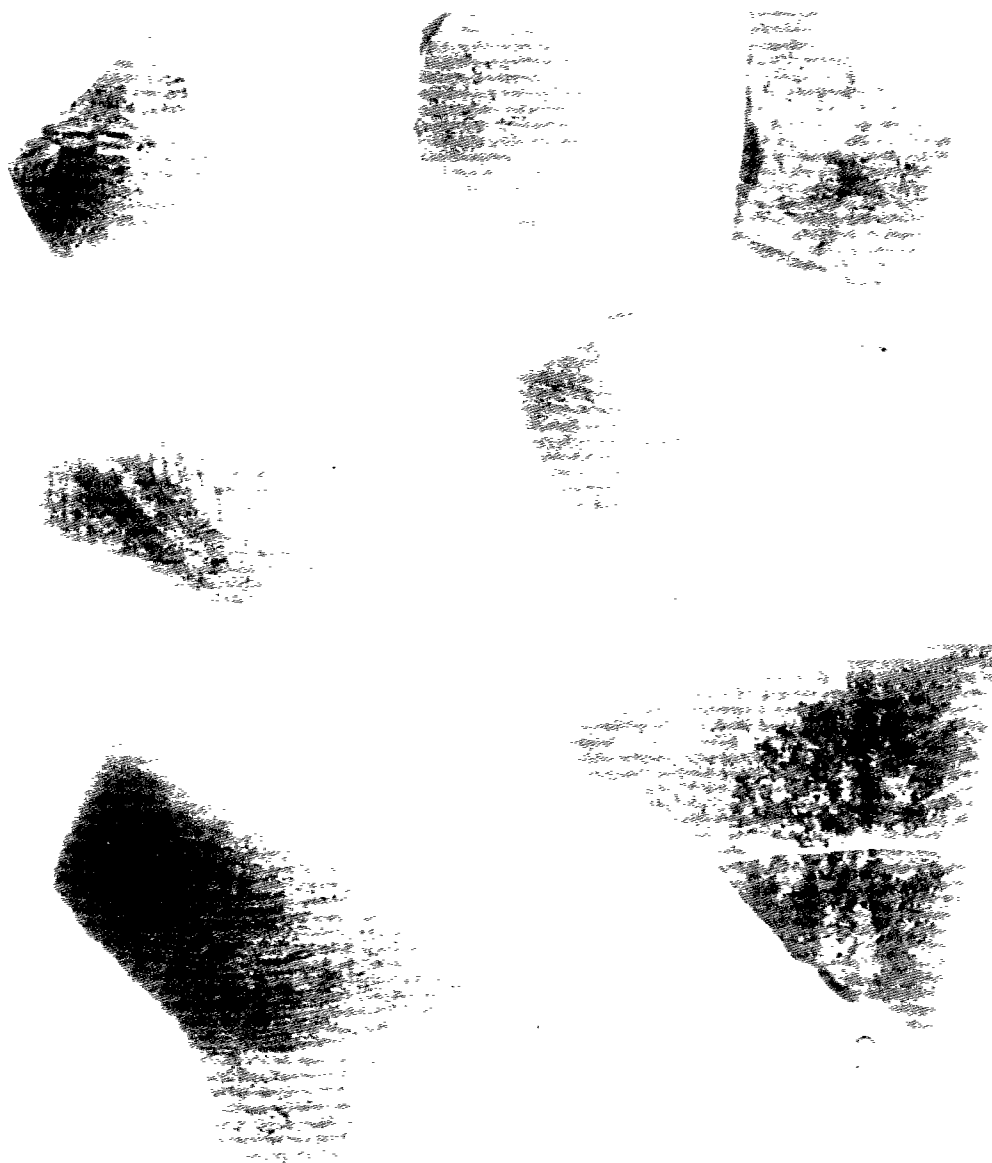
Oval structure, Sub-period IB, Phase II. See p. 43



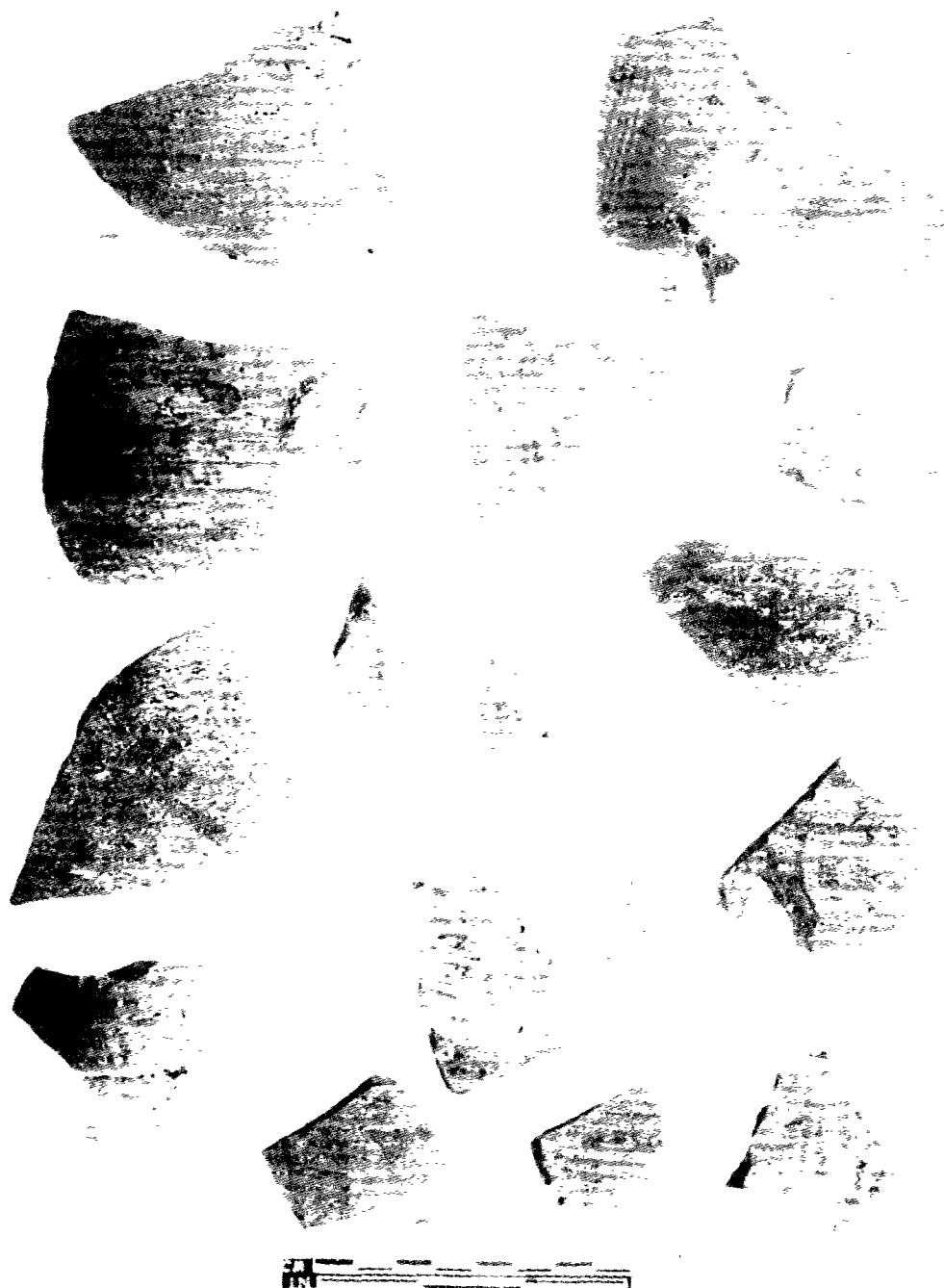
Thick grey mat-impressed potsherds, Sub-period IB. See p. 49



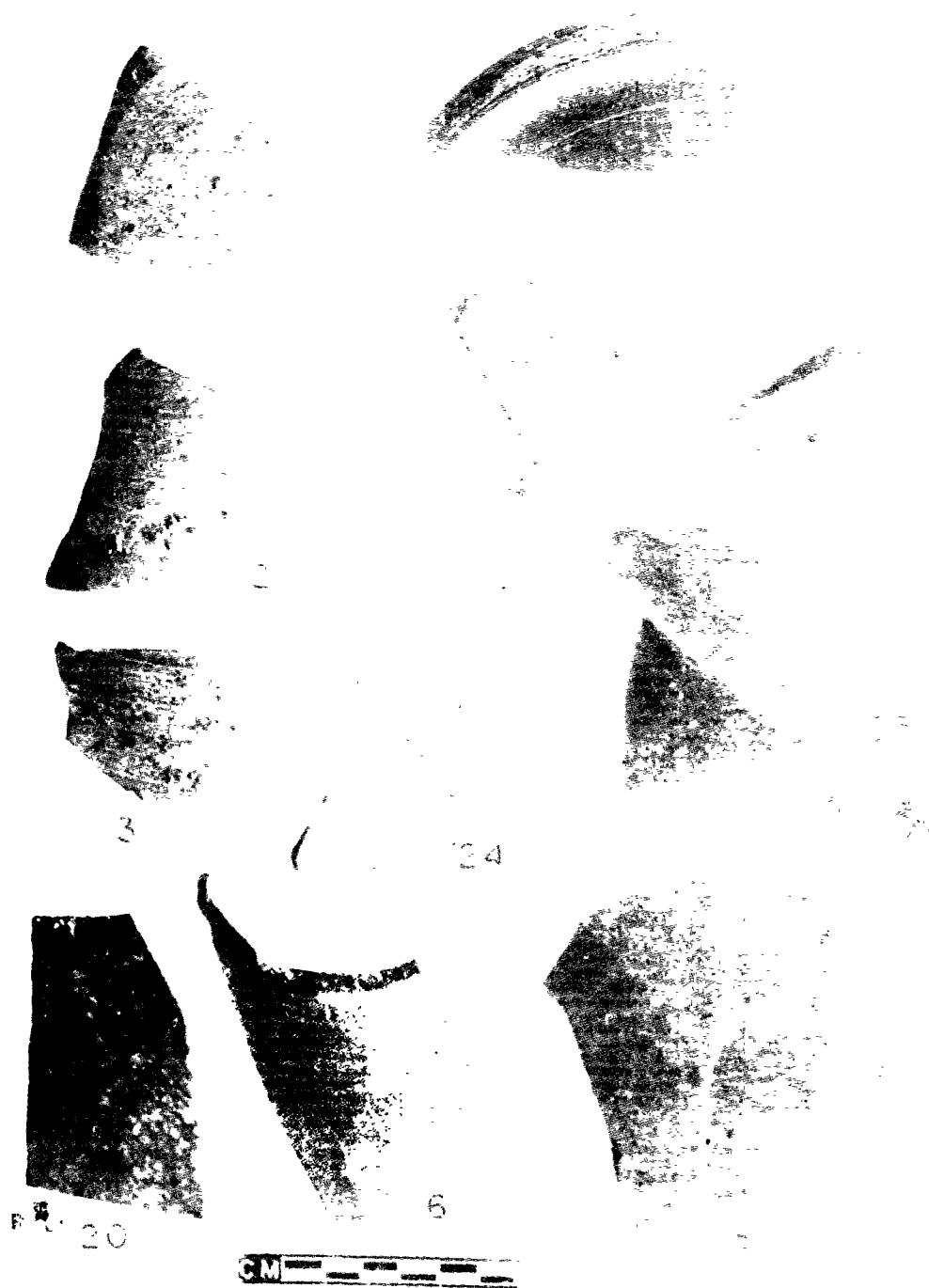
Painted red ware designs, Sub-period IA and IB. See p. 85



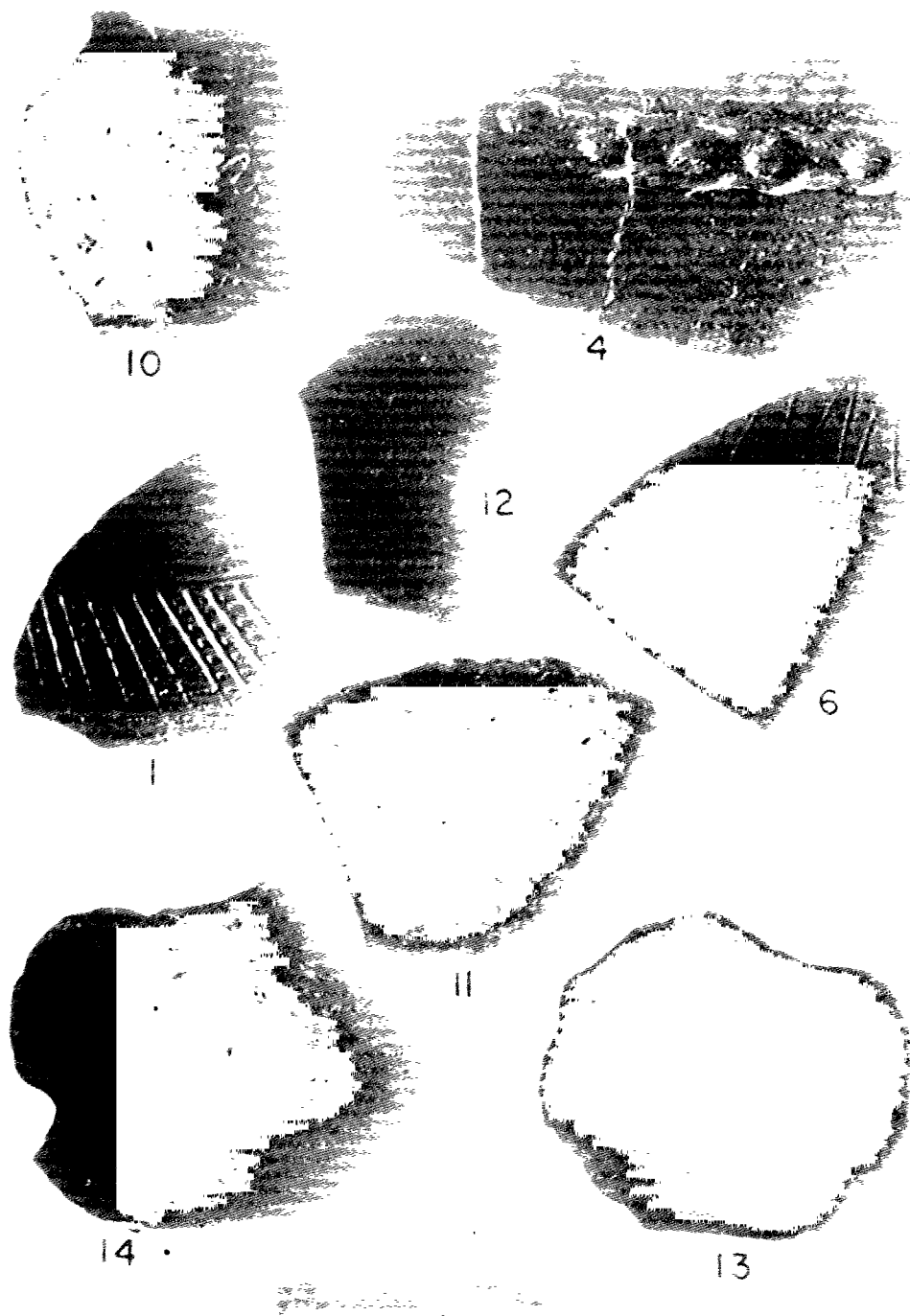
Painted red ware designs, Sub-period IA and IB. See p. 85



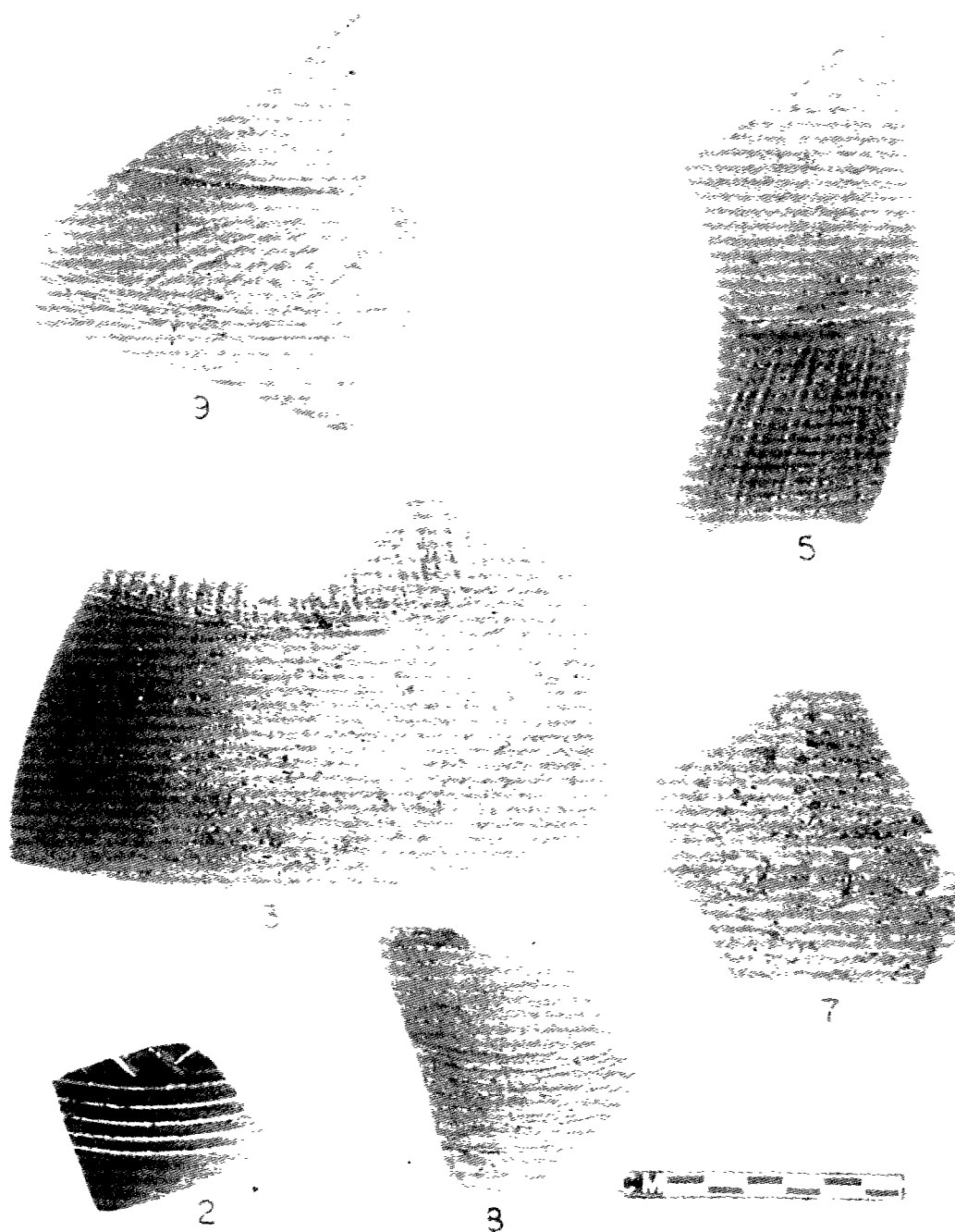
Painted red ware designs, Sub-period IA and IB. See p. 87



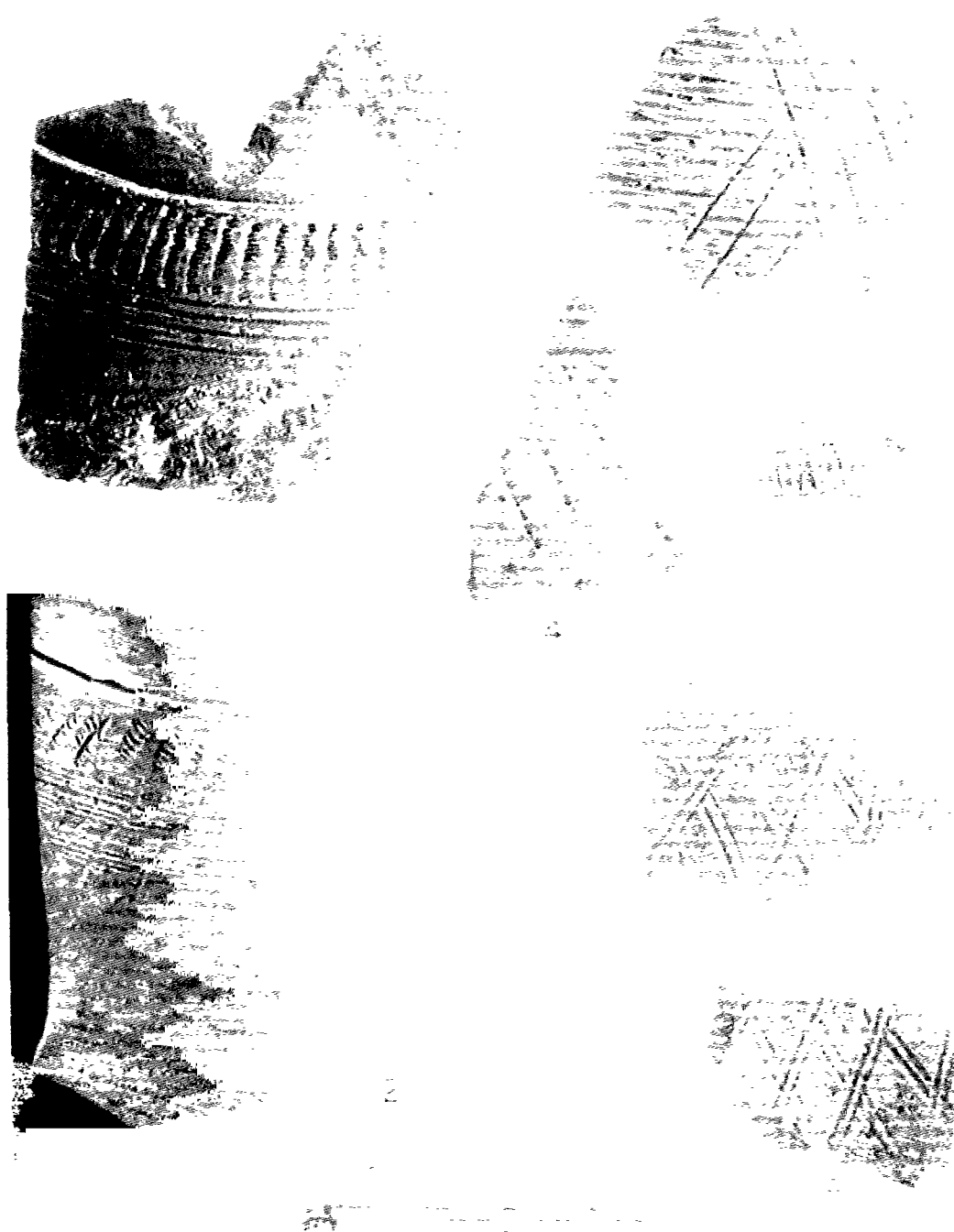
Painted red ware, Sub-period IA and IB. See p. 87



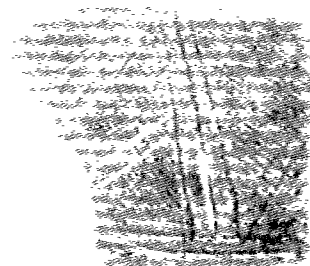
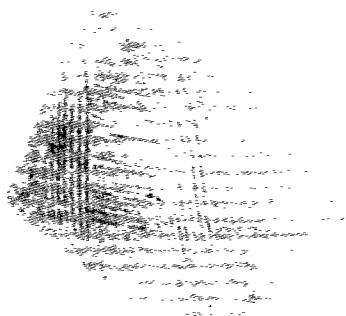
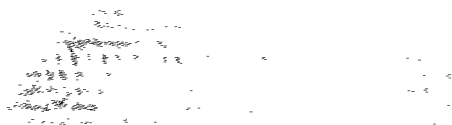
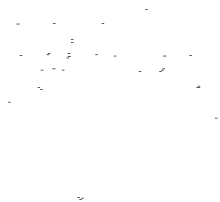
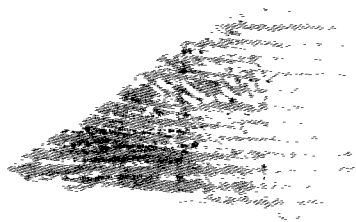
Incised red ware, Sub-period IA and IB. See p. 90



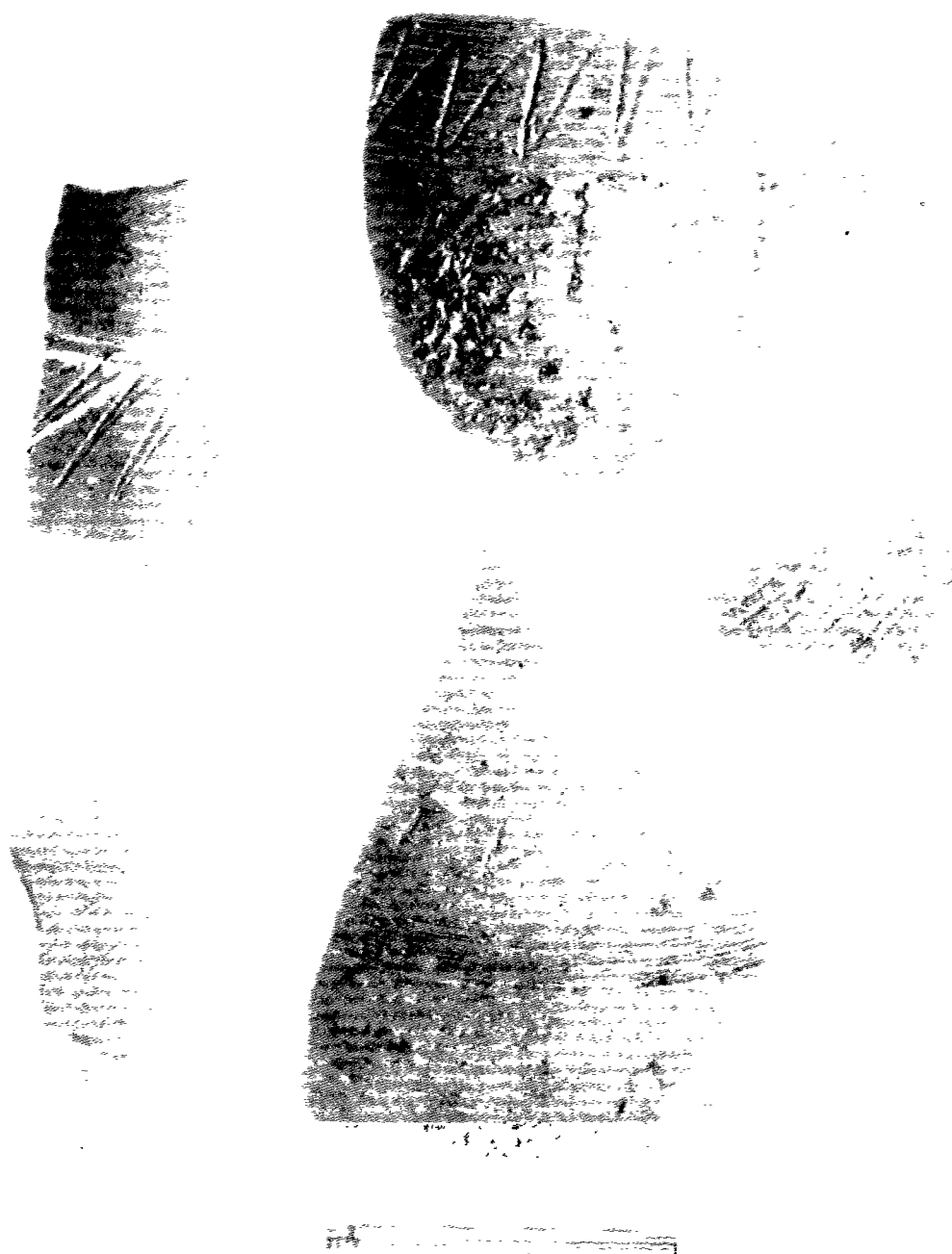
Incised red ware, Sub-period IA and IB. See p. 90



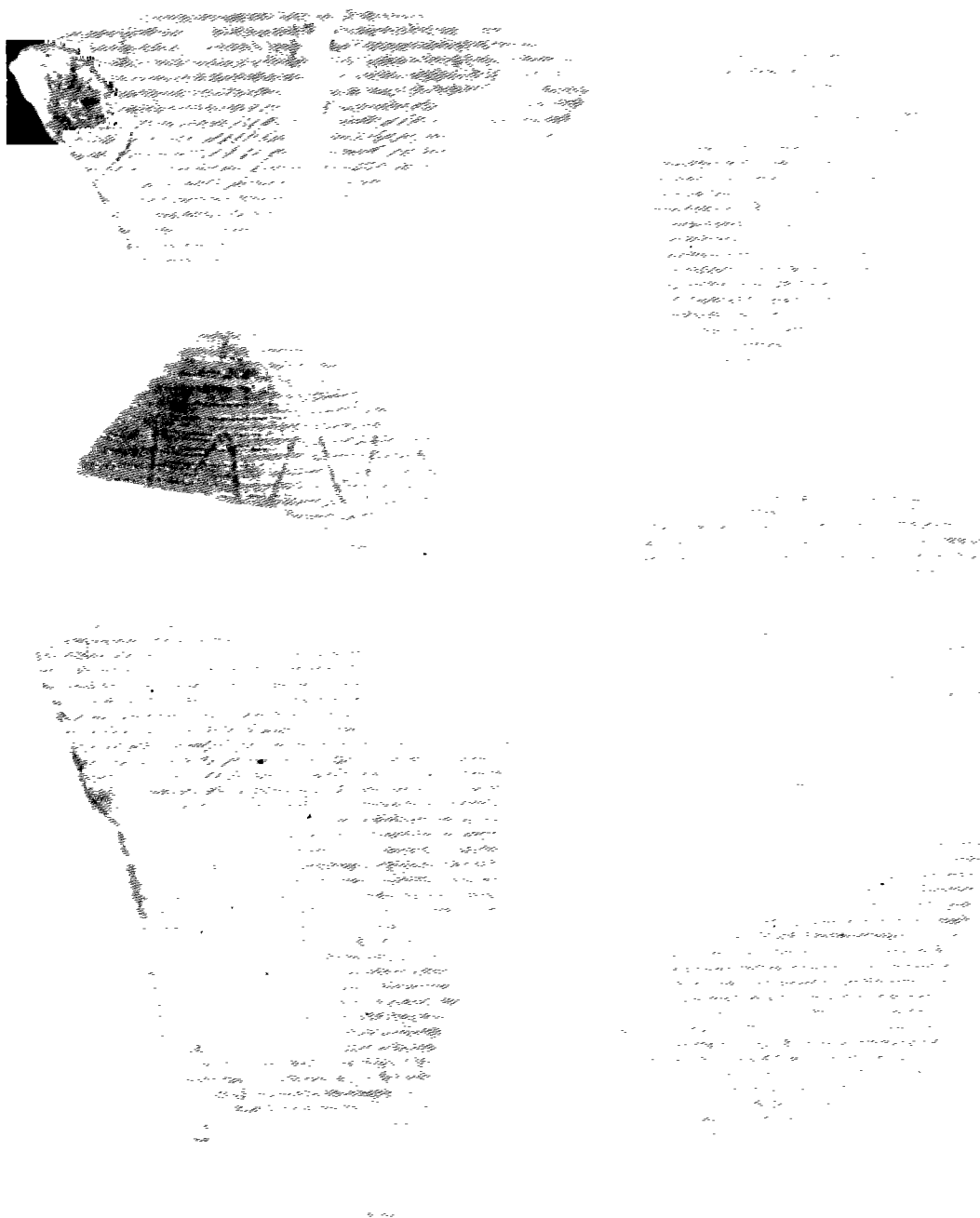
Incised red ware, Sub-period IA and IB. See p. 92



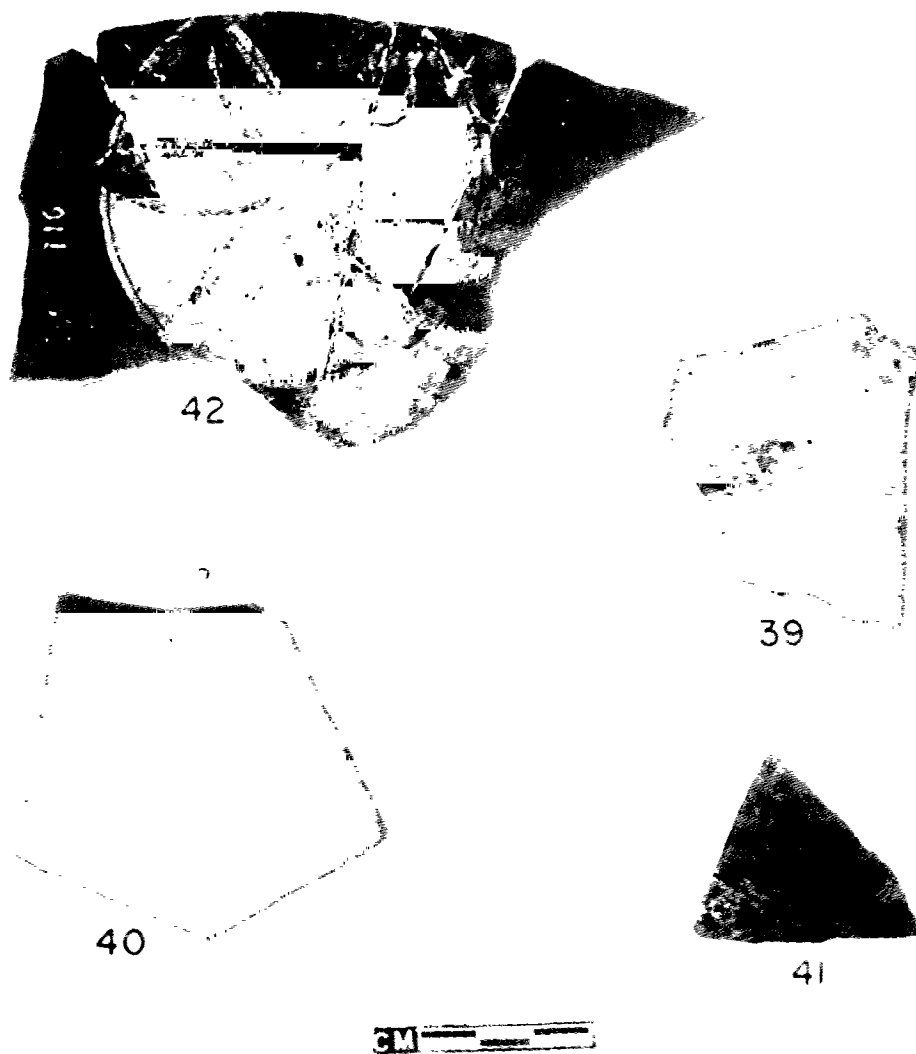
incised red ware, Sub-period IA and IB. See p. 92



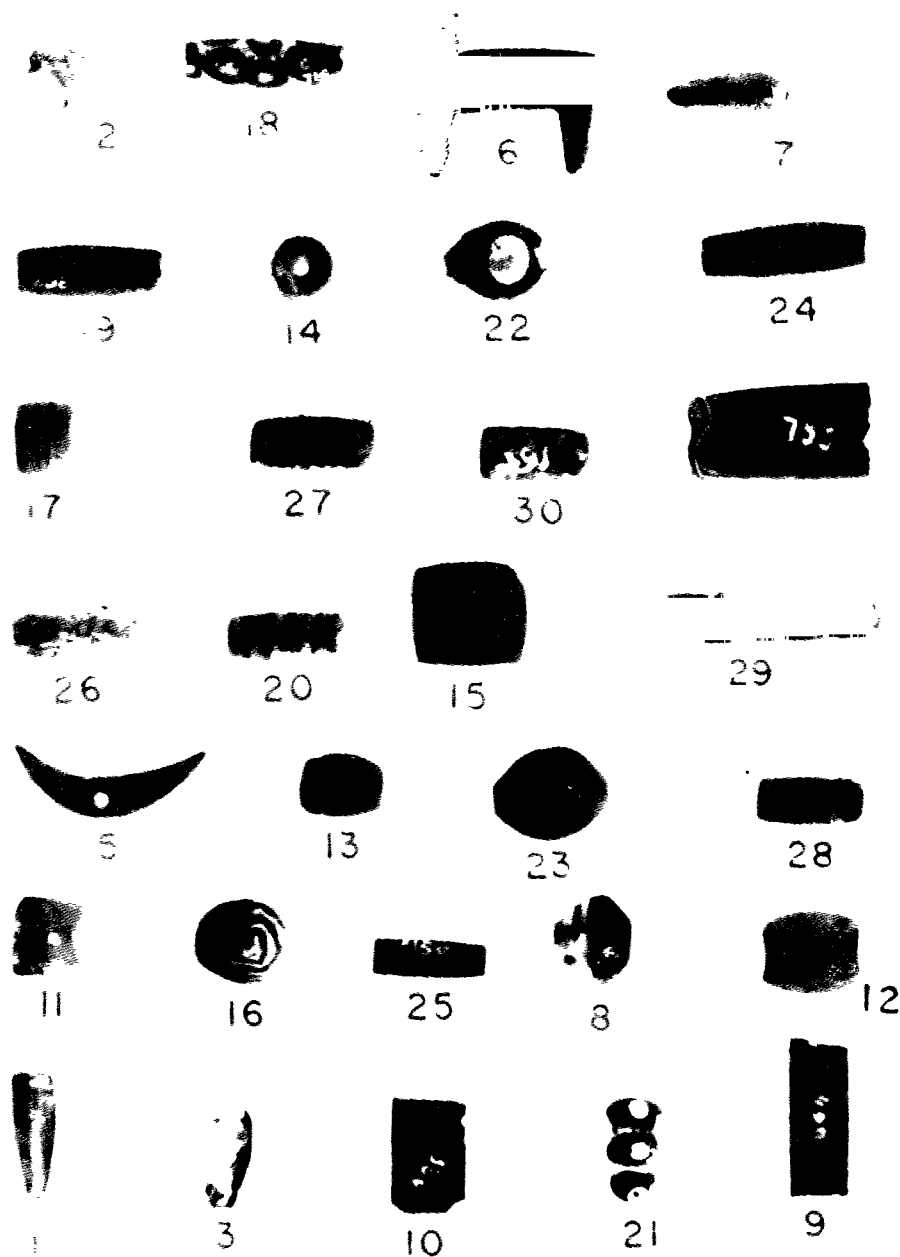
Incised red ware, Sub-period IA and IB. See p. 94



Incised red ware, Sub-period IA and IB. See p. 94



Painted Grey Ware, Sub-period IB See p 105



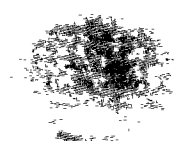
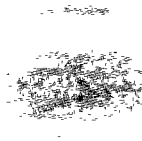
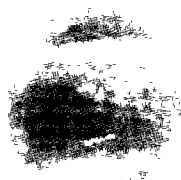
Beads of semiprecious stones. See p. 118



Beads of semiprecious stones. See p. 120



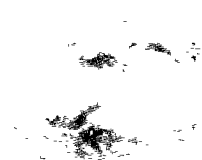
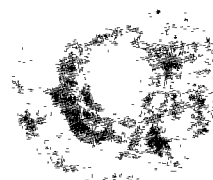
A



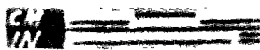
3



10

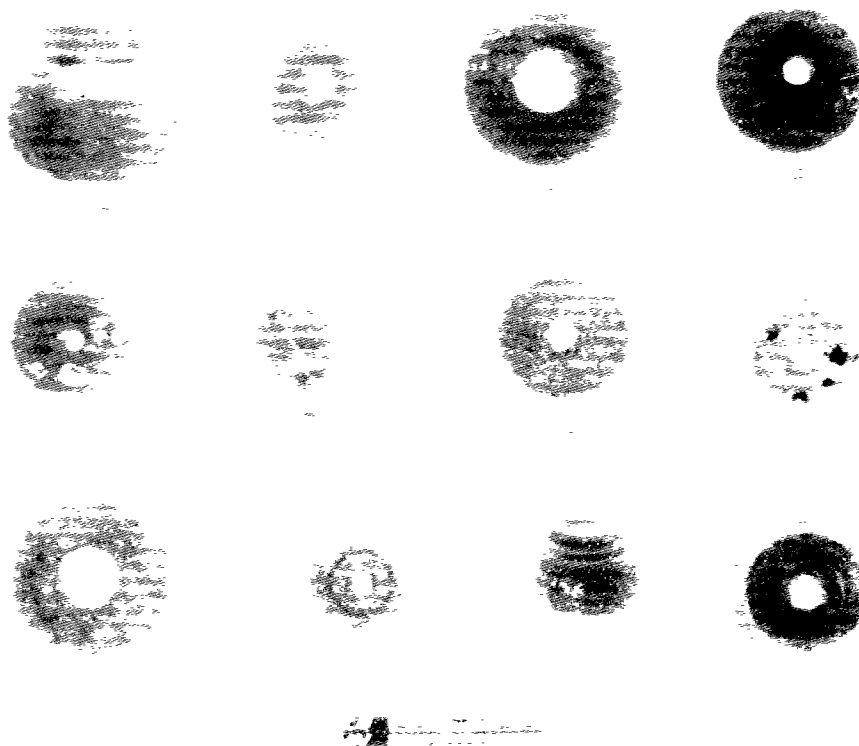


4

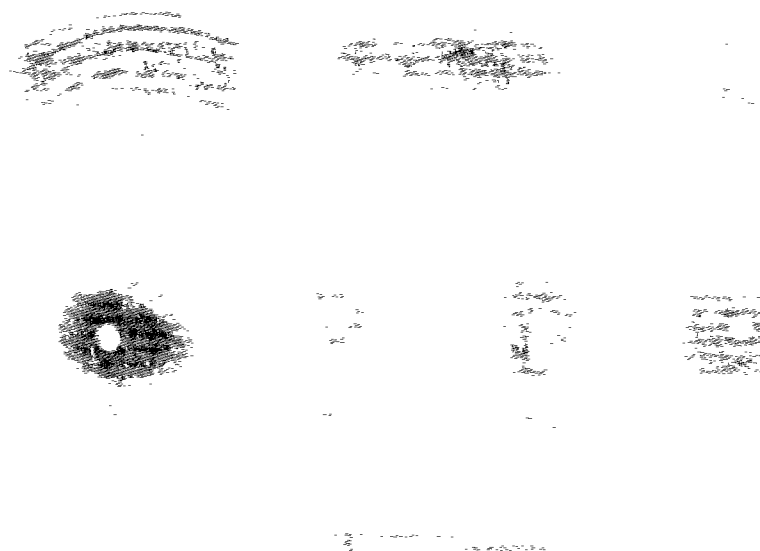


B

Beads of : A, semiprecious stones and faience ; B, terracotta. See p. 122

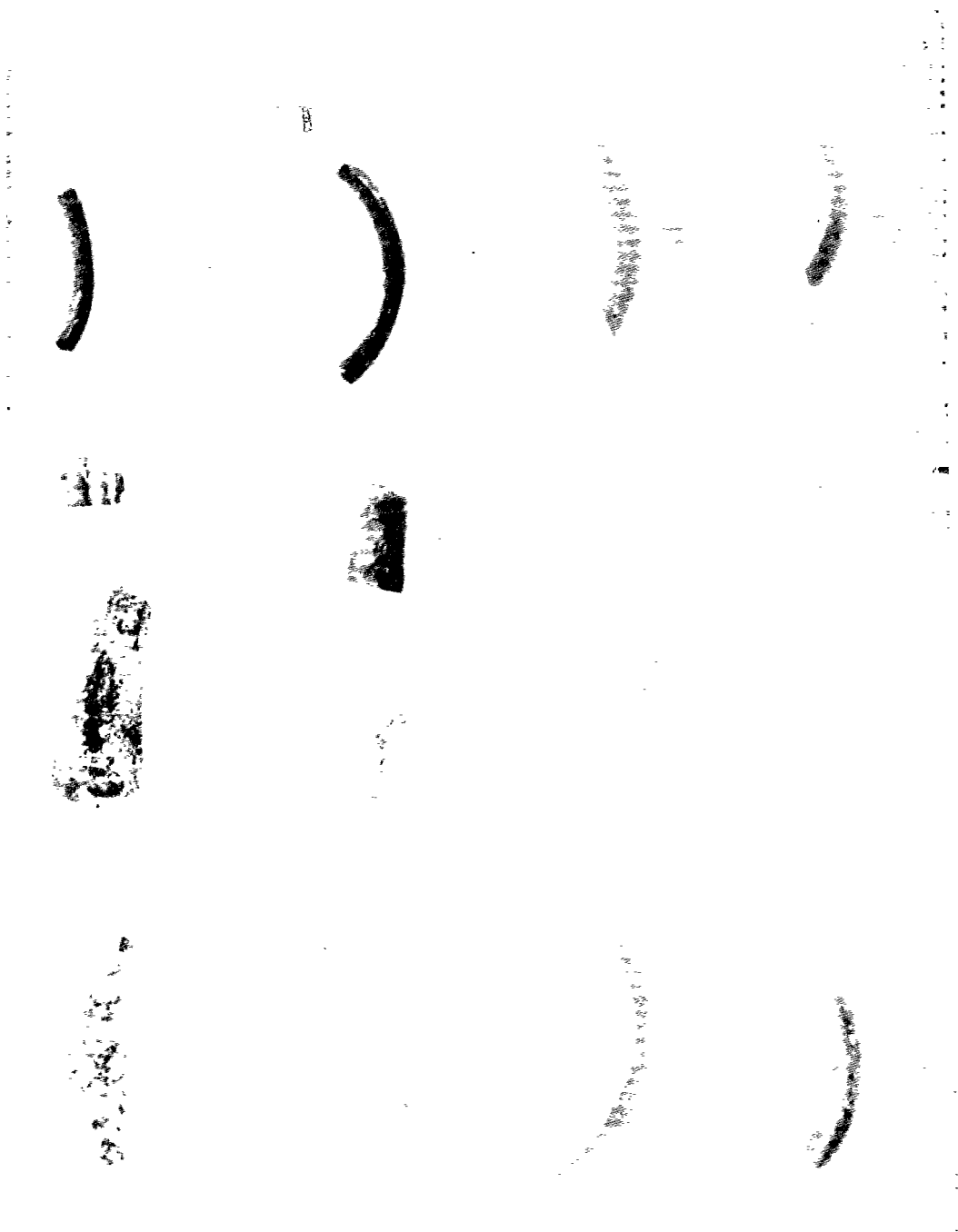


A



B

Beads of terracotta. See p. 122



Bangles. See p. 124



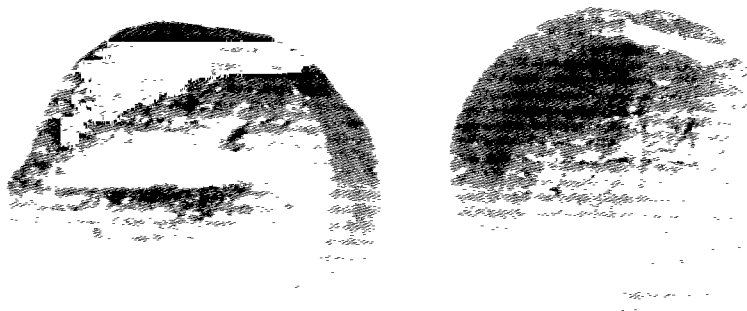
A, faience bangles; B, terracotta human figurines. See pp. 125-126



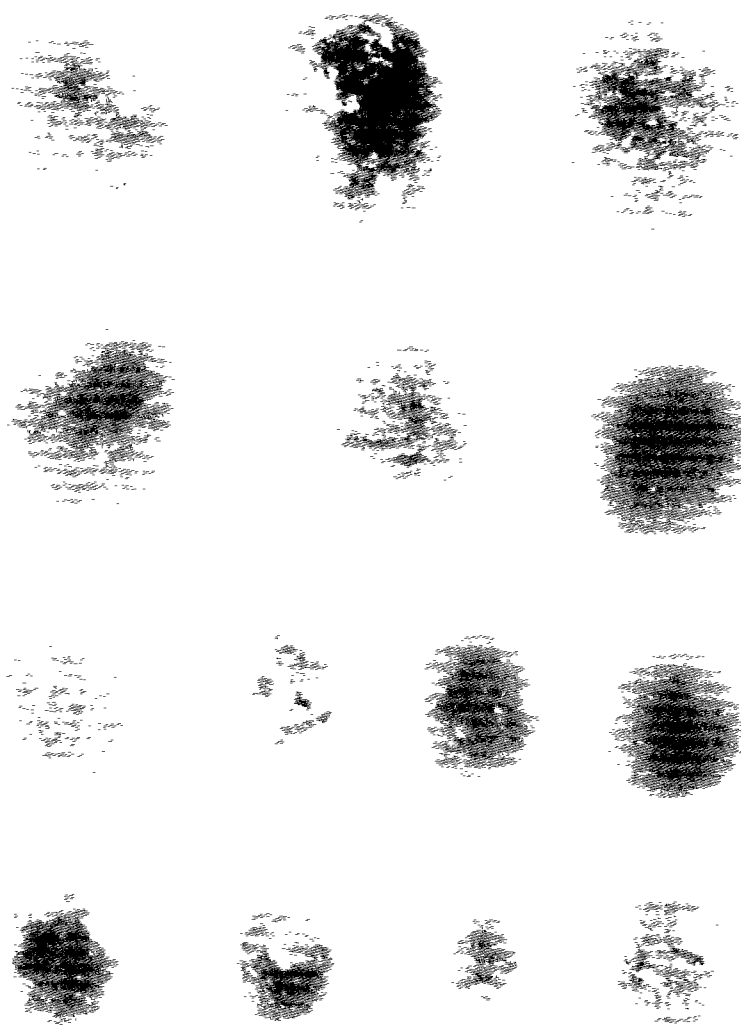
Terracotta animal figurines. See p. 127



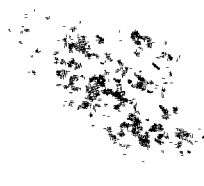
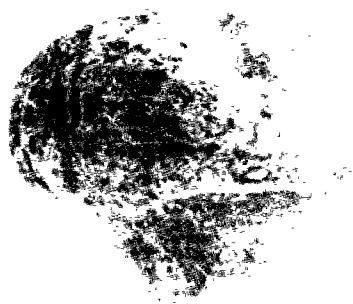
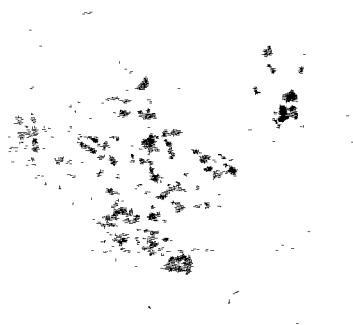
Terracotta animal figurines. See p. 127



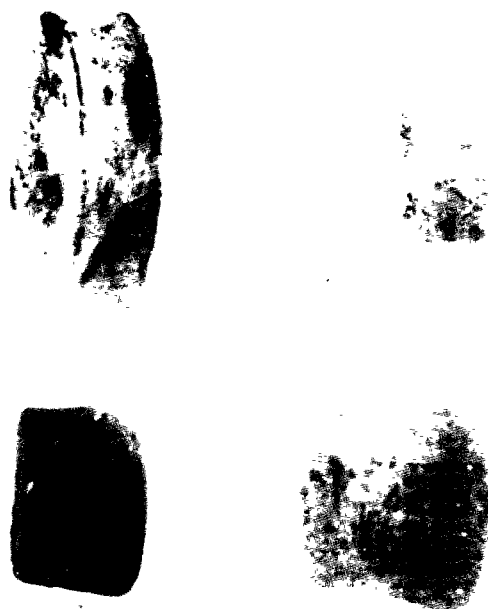
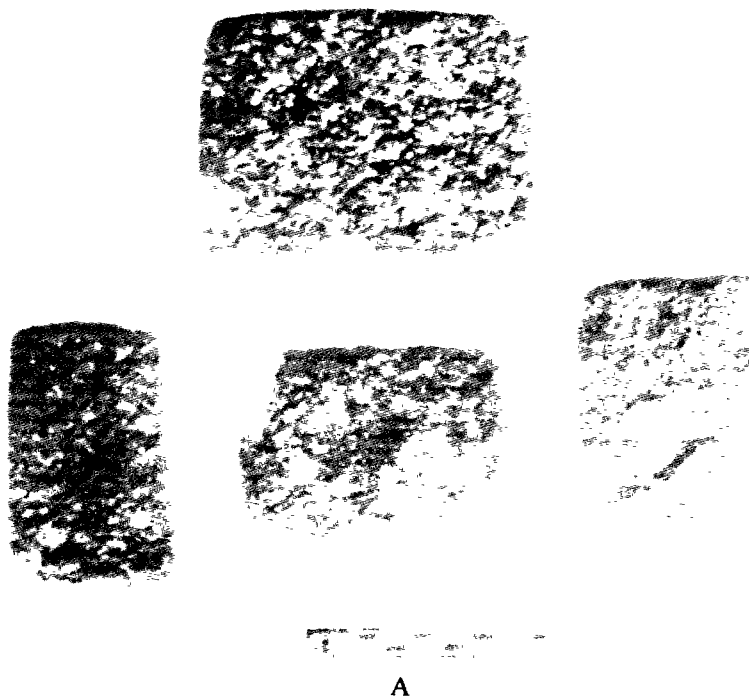
A



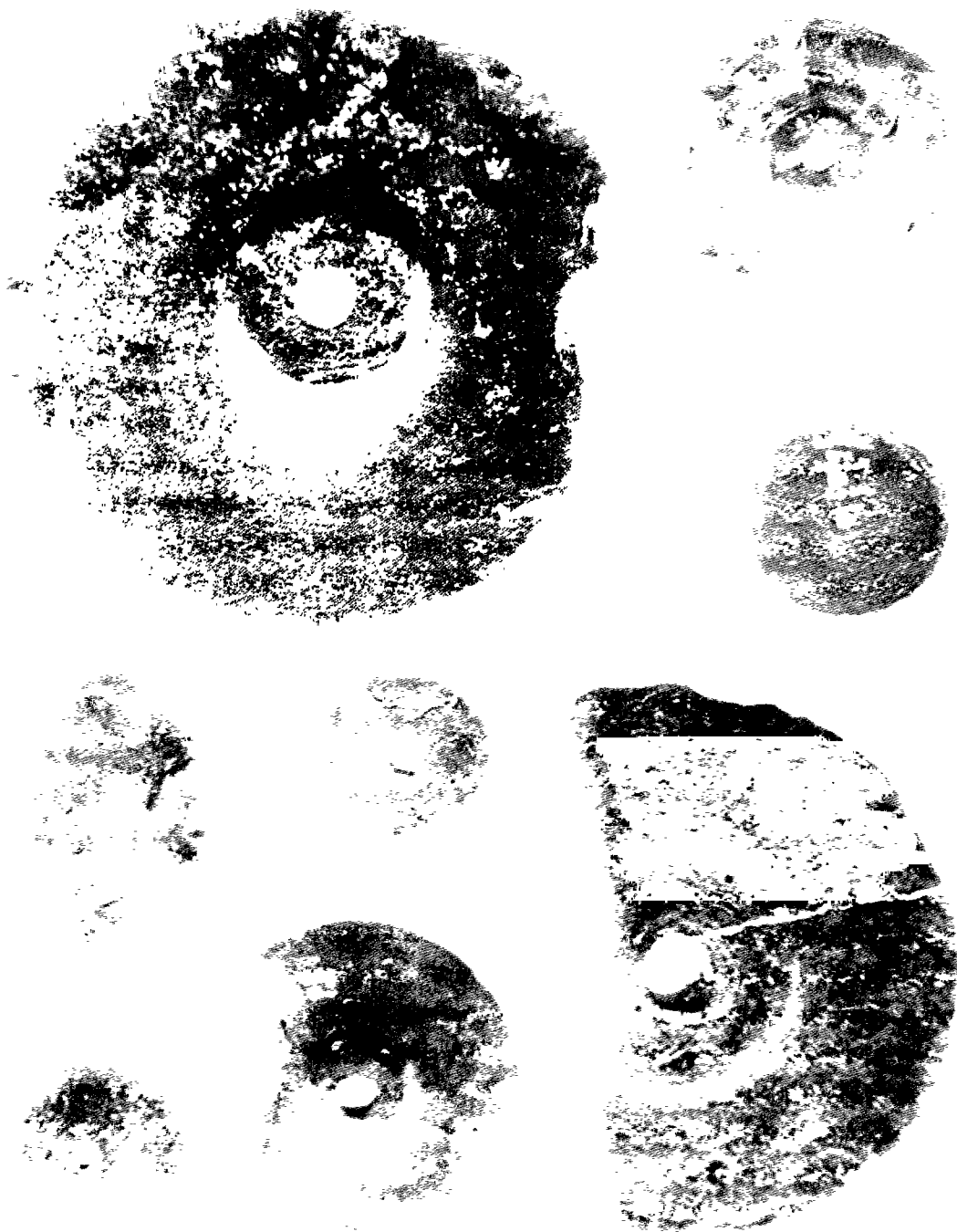
B



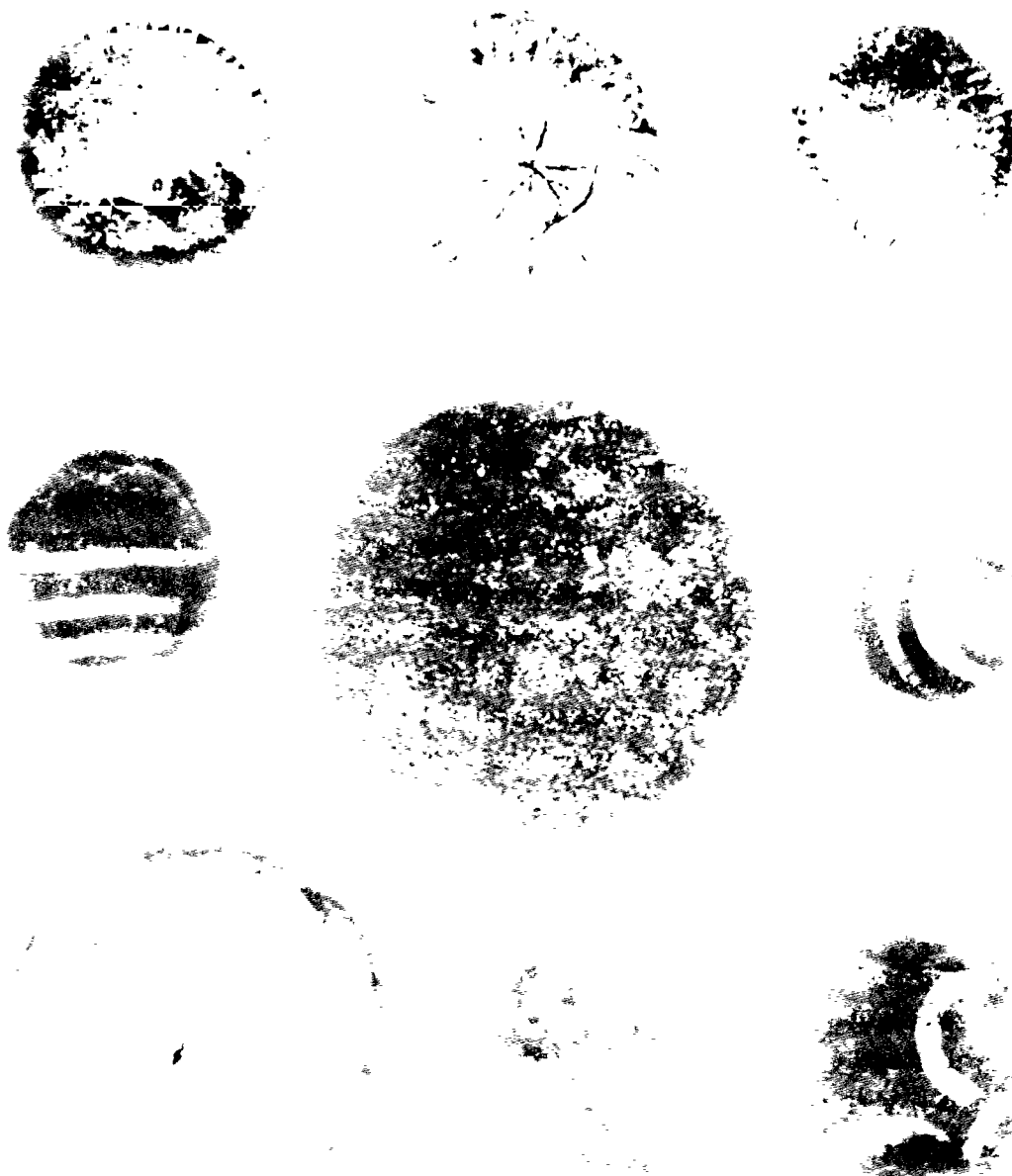
Terracotta stoppers. See p. 130



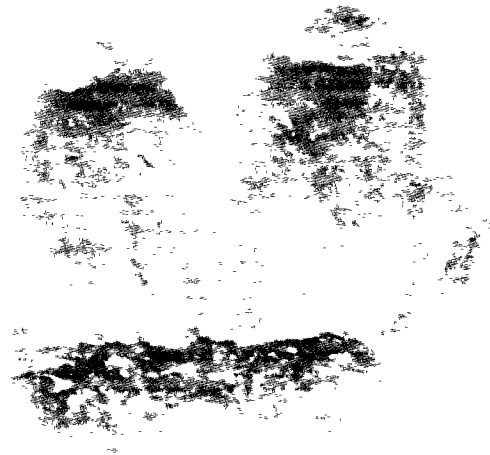
B
A, terracotta skin rubbers;
B, terracotta and bone ear-ornaments.
See pp. 130-131



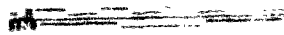
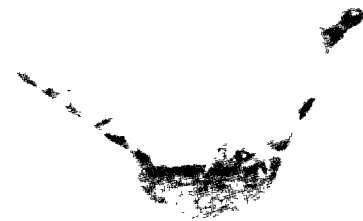
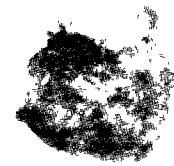
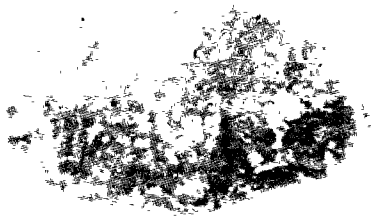
Terracotta wheels. See p. 131



Terracotta hopscotch and toy cart frame. See p. 132

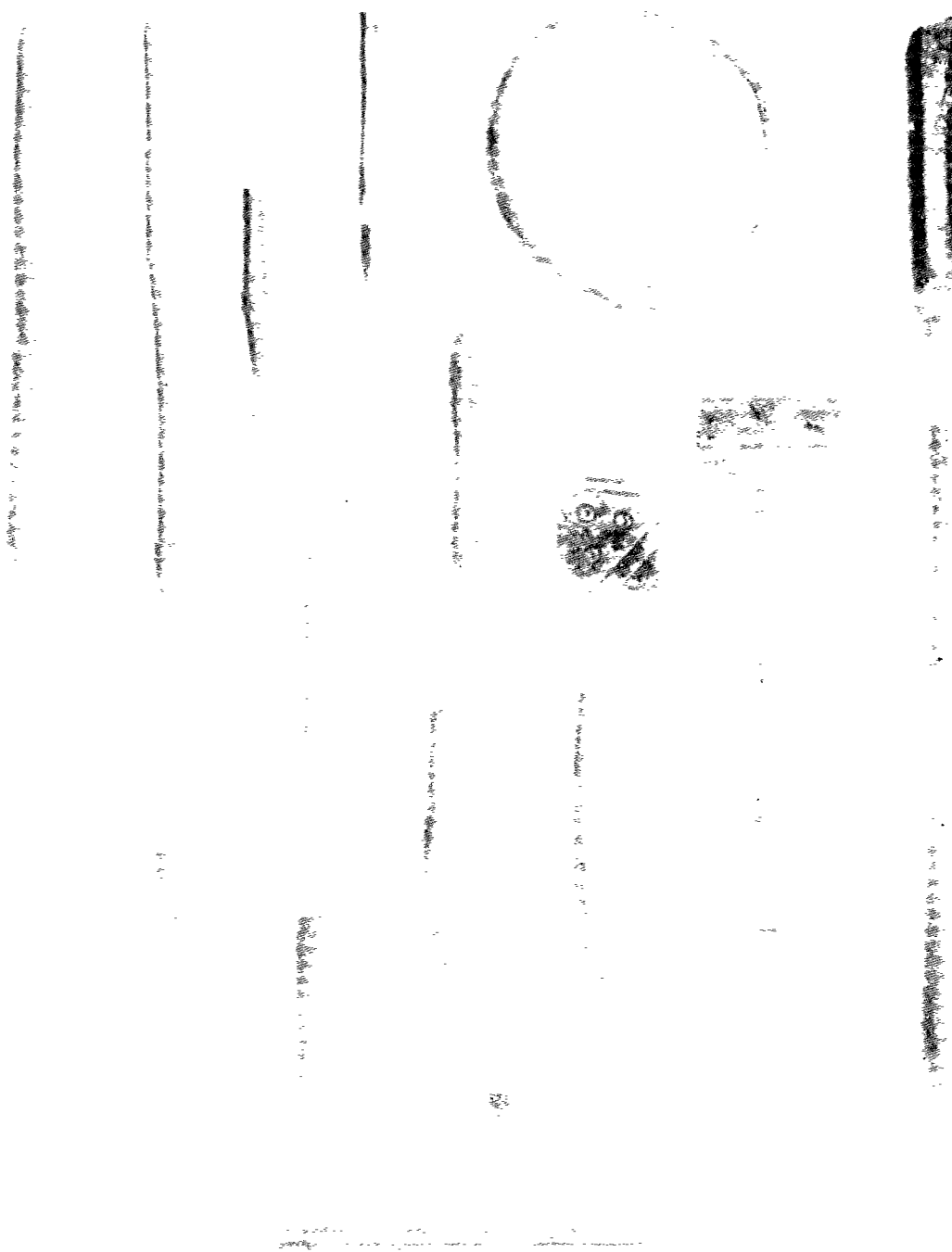


A

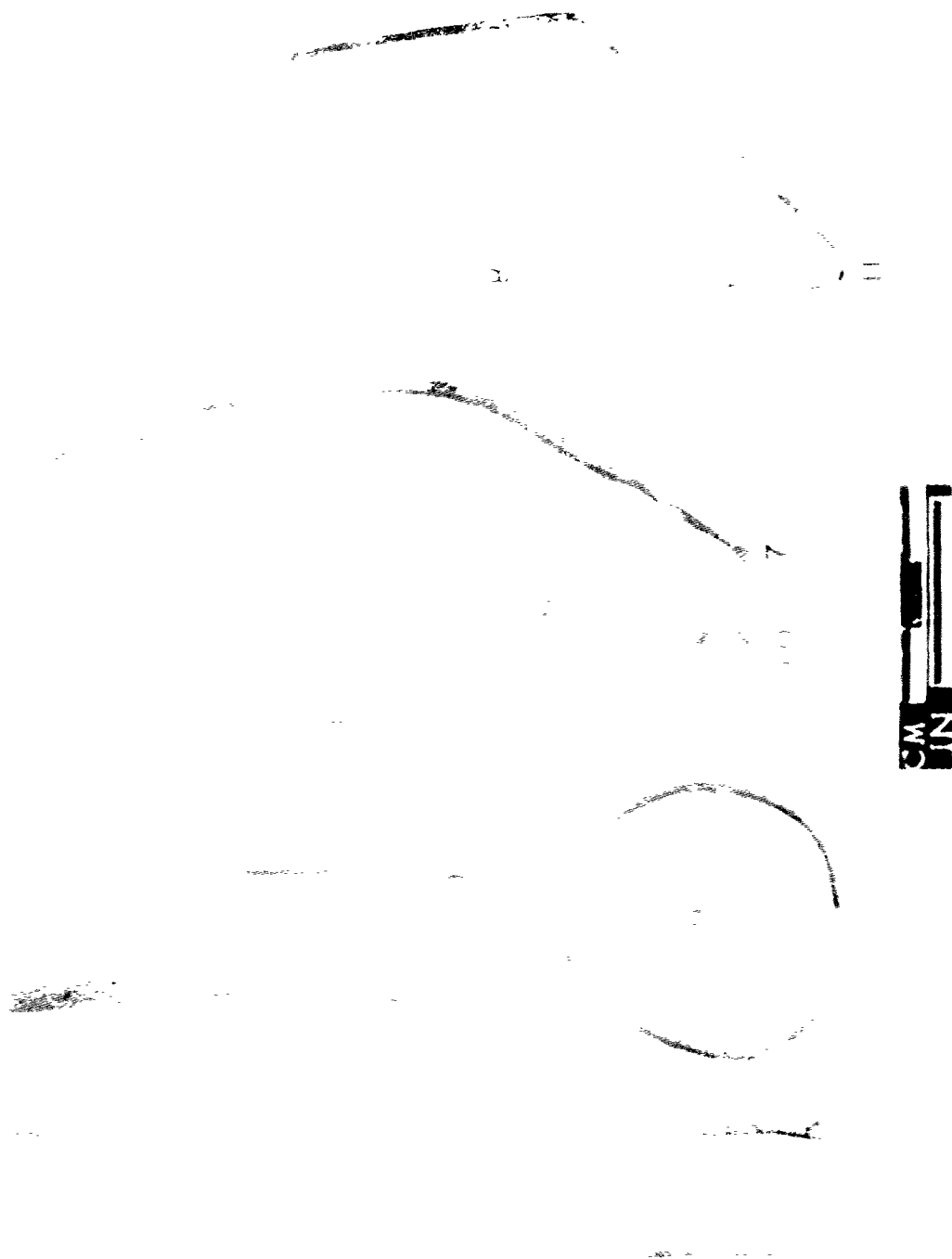


B

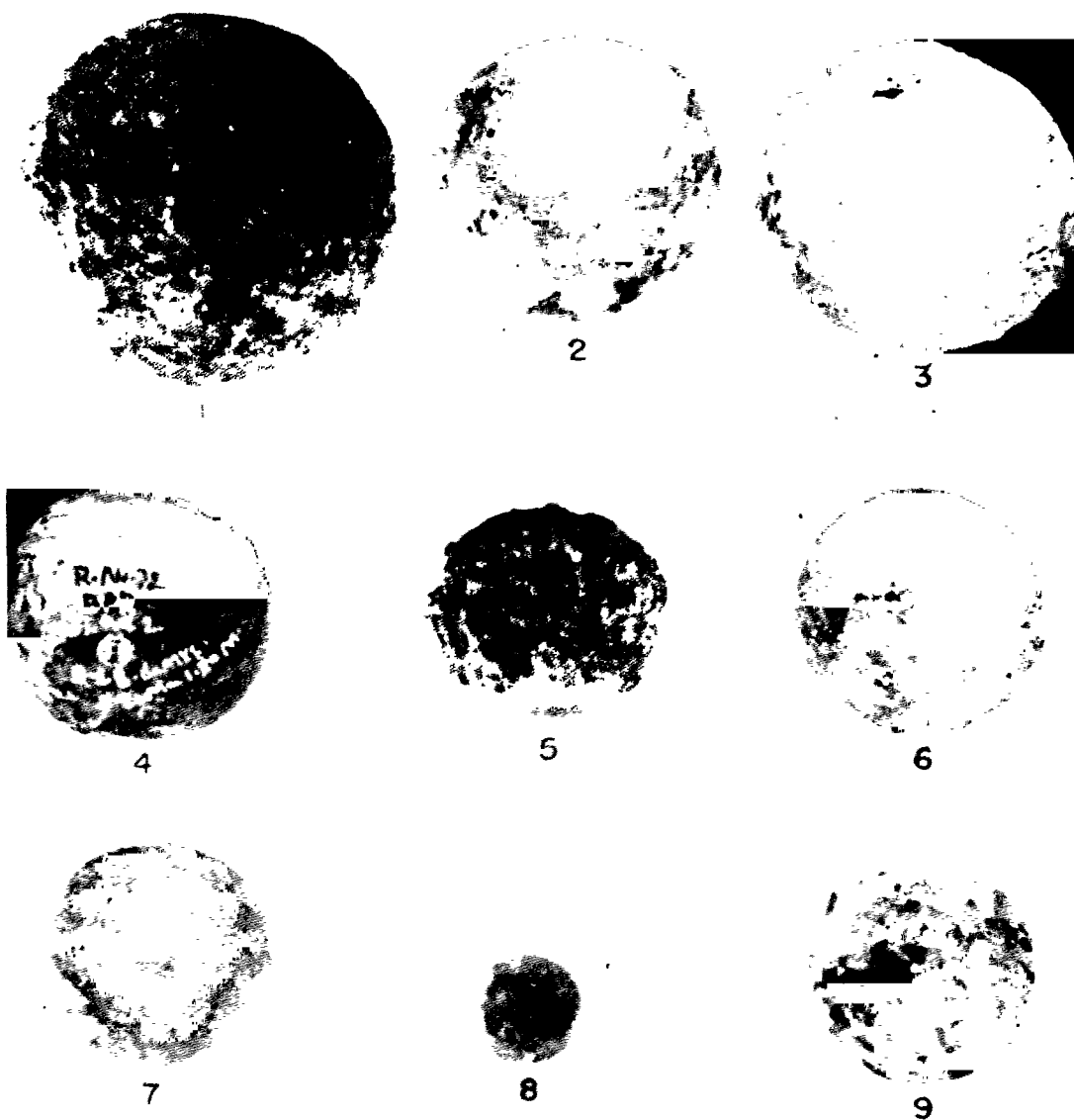
Terracotta miscellaneous objects. See p. 133



Bone and ivory objects. See p. 134



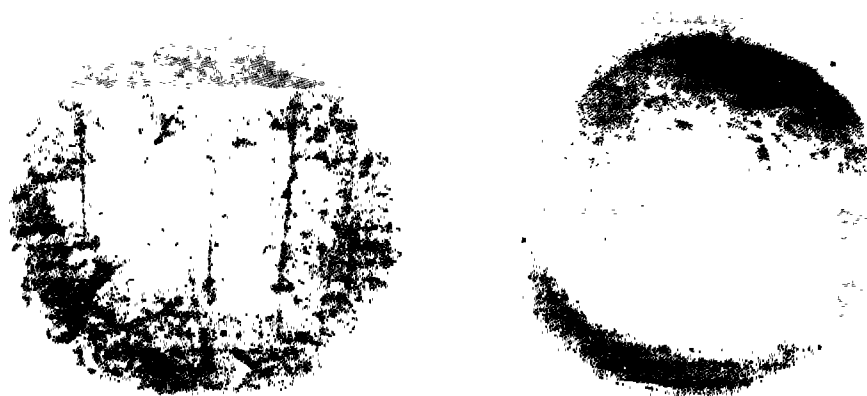
Copper objects. See p. 136



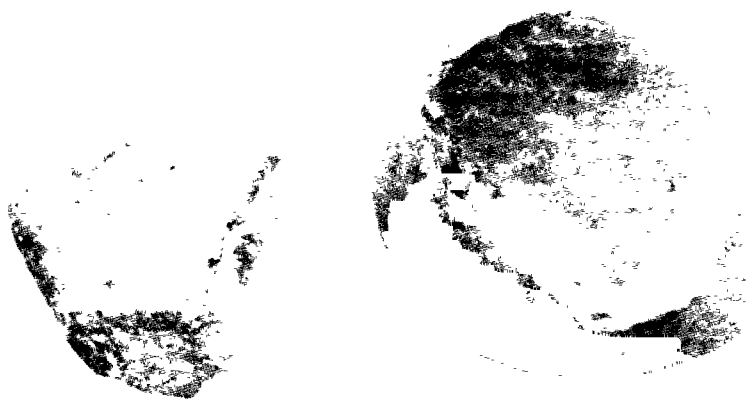
Stone Balls See p. 137



Stone querns and pestles. See p. 137

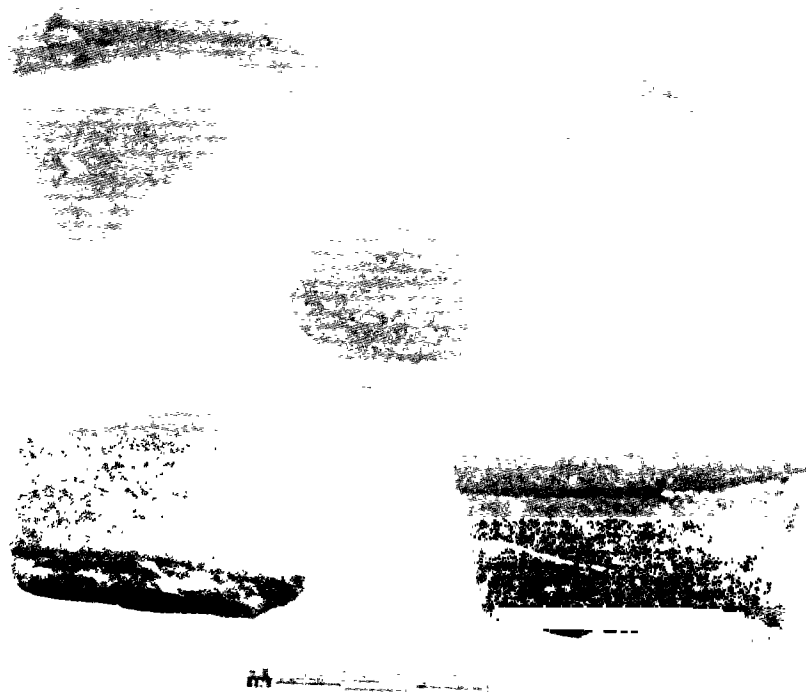


A

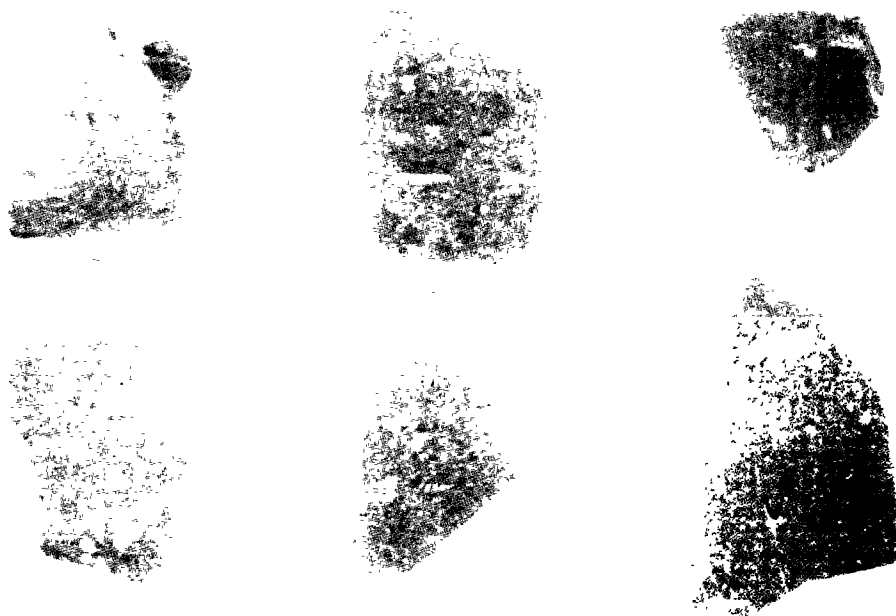


E

Terracotta inscribed objects. See p. 139

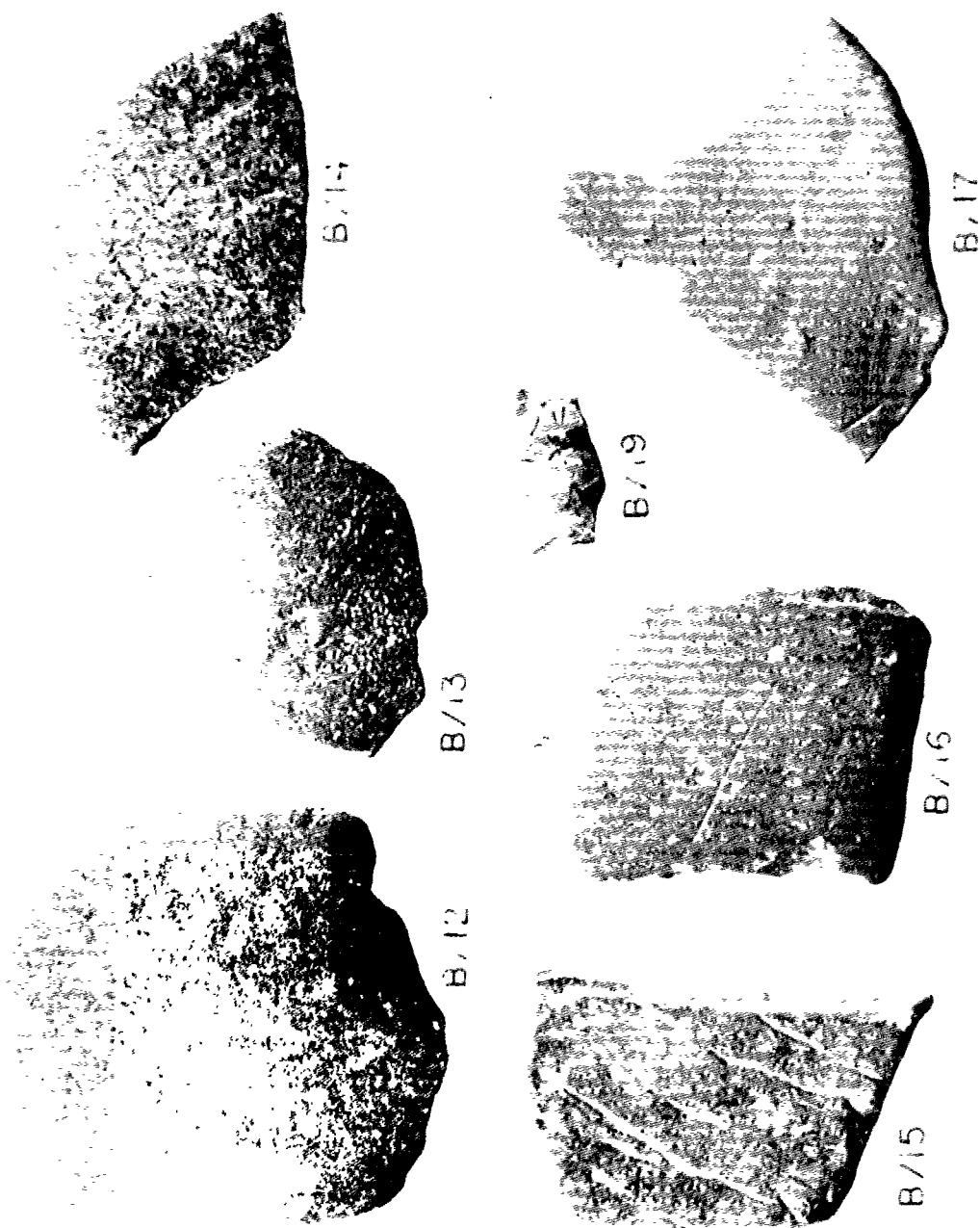


A

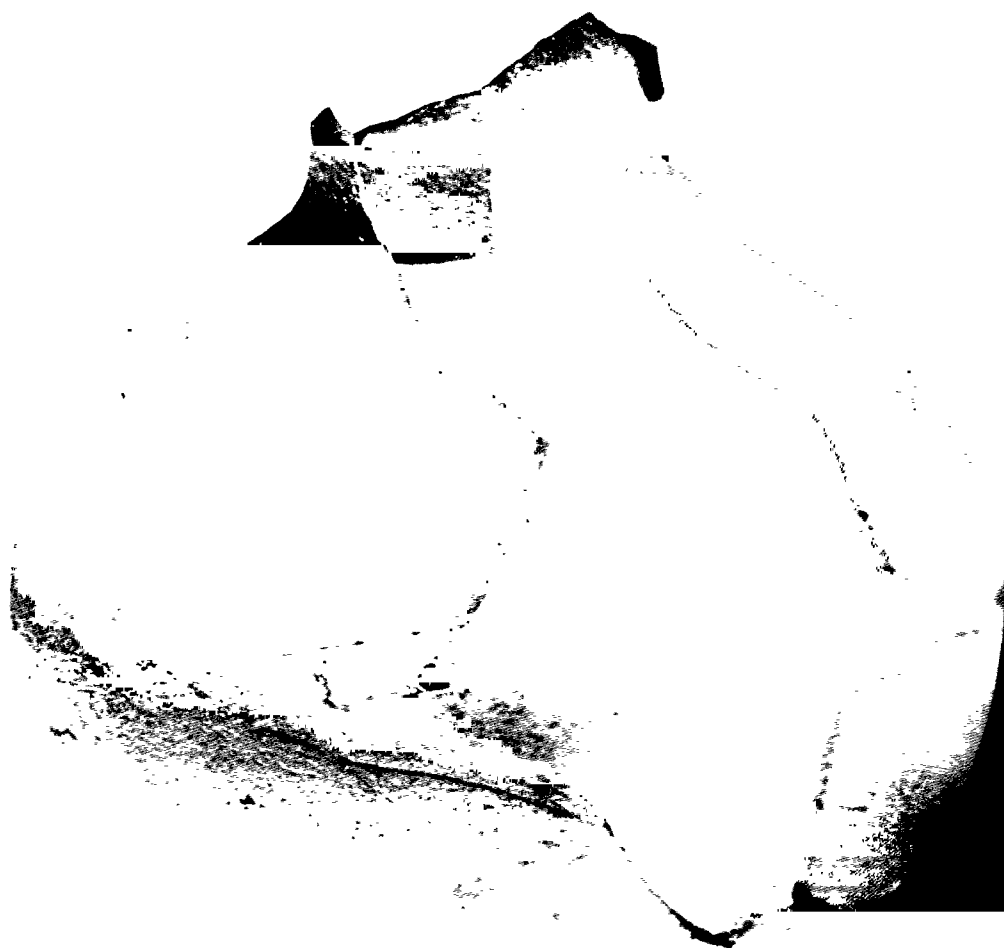


B

Graffiti on pottery. See p. 139



Graffiti on pottery. See p. 139



Graffiti on pot. See p. 139

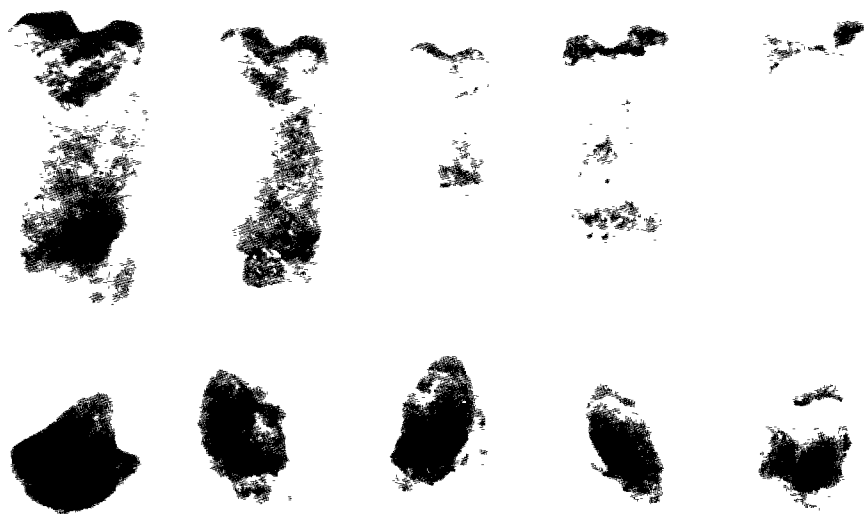


A

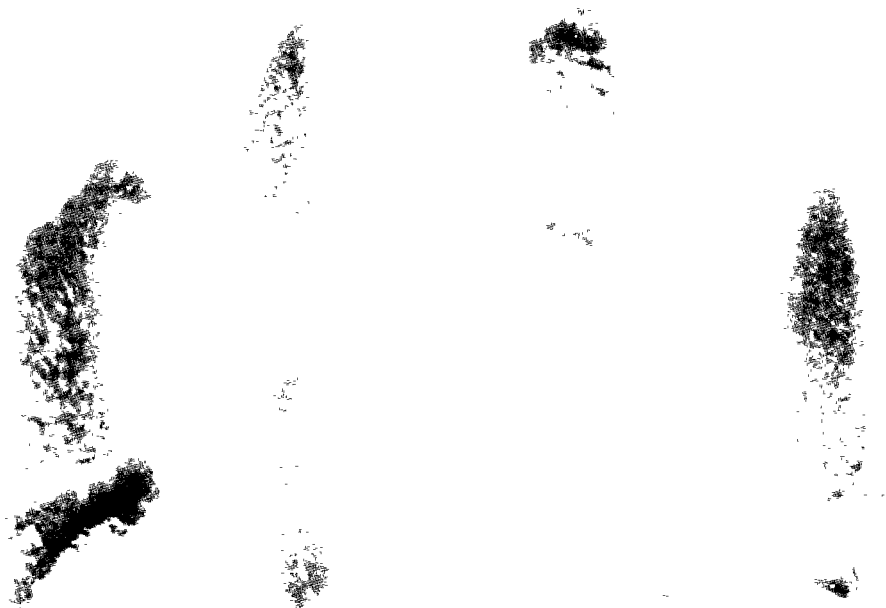


B

Bones of cattle. See p. 146



A

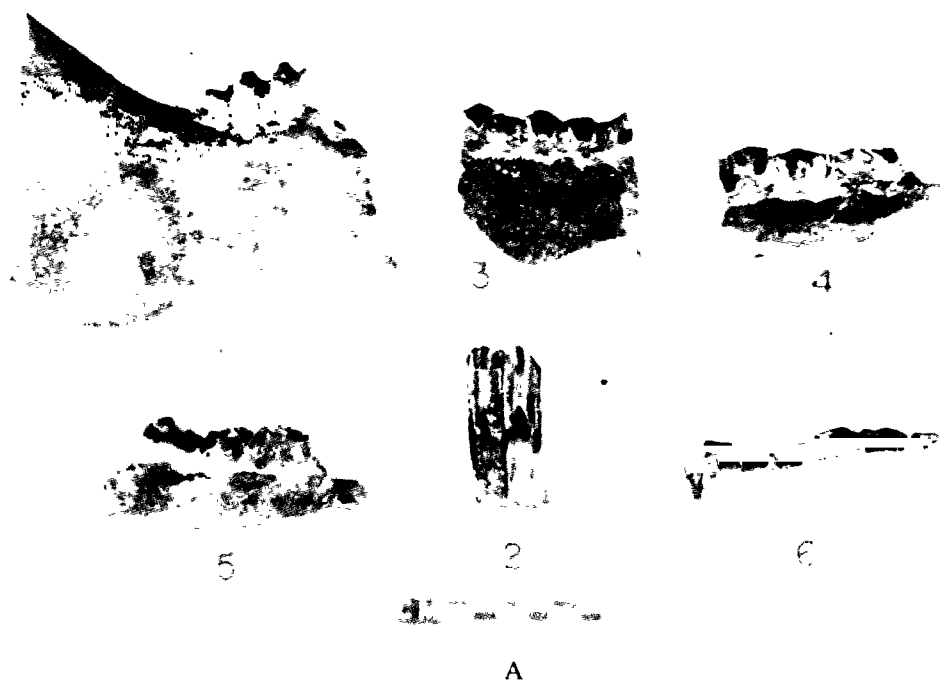


B

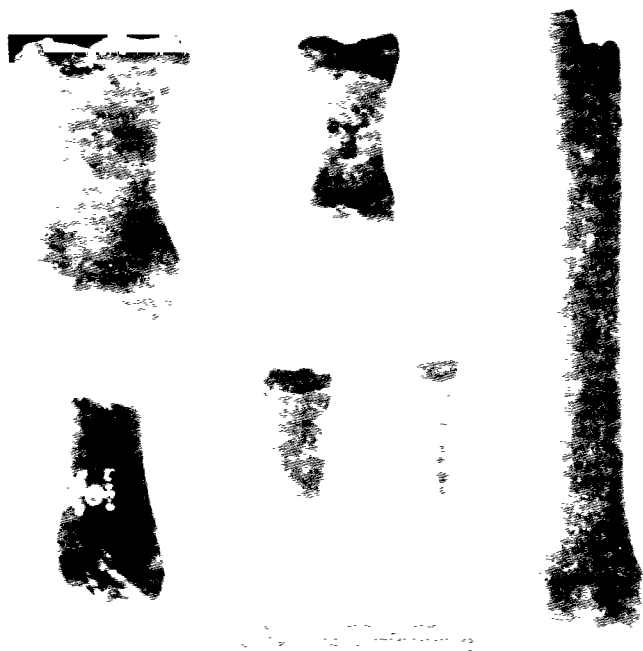
A, phalanges of cattle of different sizes; B, bones of cattle, sheep and goat. See p. 146



Bones of sheep and goat. See p. 146



Bones of sheep and goat. See p. 146

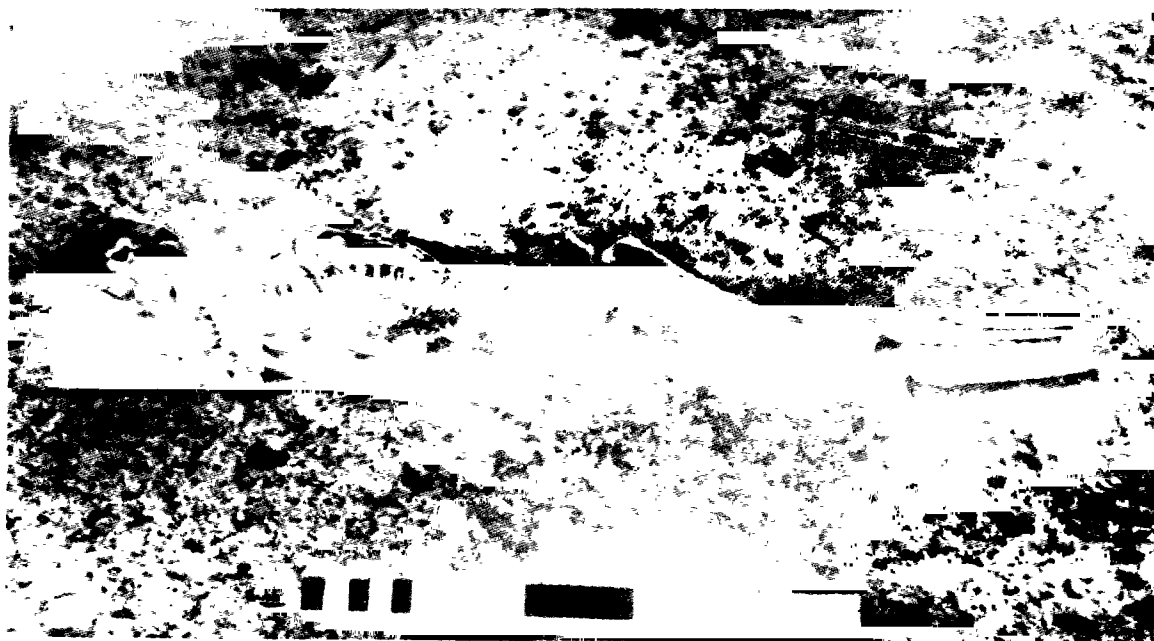


A

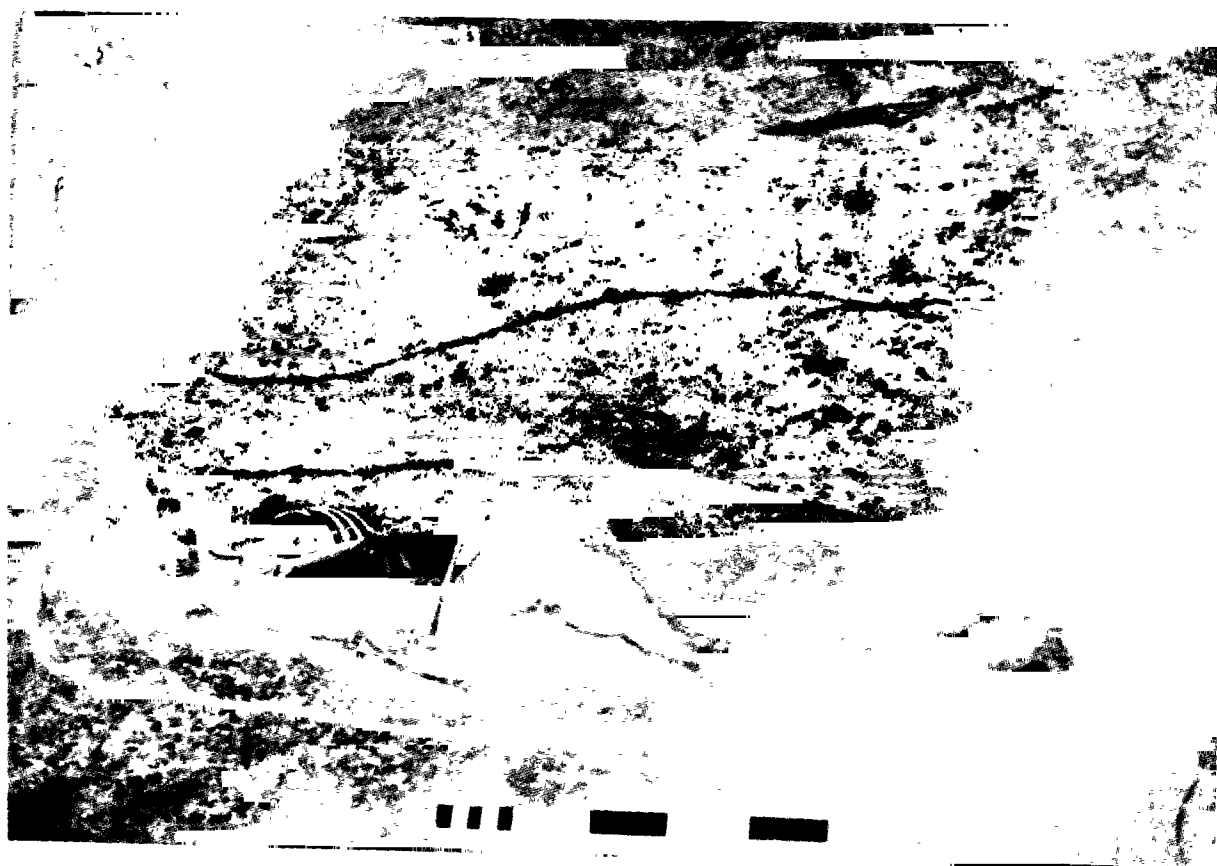


B

*Bones: A, 1, 3, 5, horse ; 2, 4, 6, ass,
B, tools. See pp. 147-148*



A



B

Burials: A, female child; B, male (adult). See pp. 149 and 151



A

B

A, *cranium norma lateralis*; B, *cranium norma verticalis*. See pp. 155-156



A B

A, norma lateralis, broken styloid processes; B, norma basalis. See p. 156

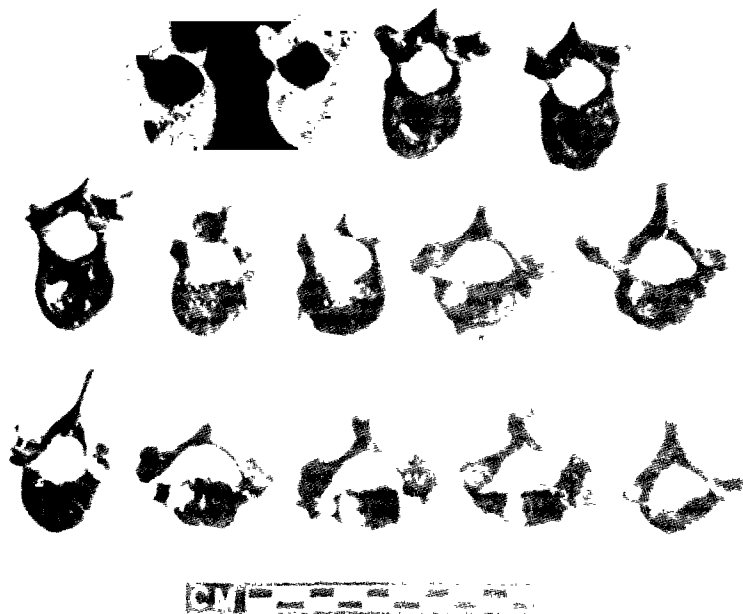


A



B

Lower jaw: A, lateral view; B, upper view. See p 156



A



B

A, vertebrae; B, humerus (right). See p. 157



A



B

A, radius (right); B, ulna (left). See p. 158

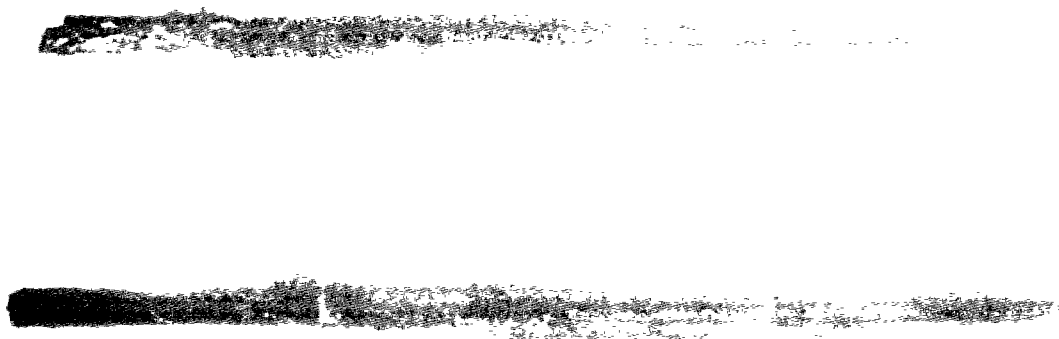


A



B

A, femur (left); B, tibia (right). See p. 159



A

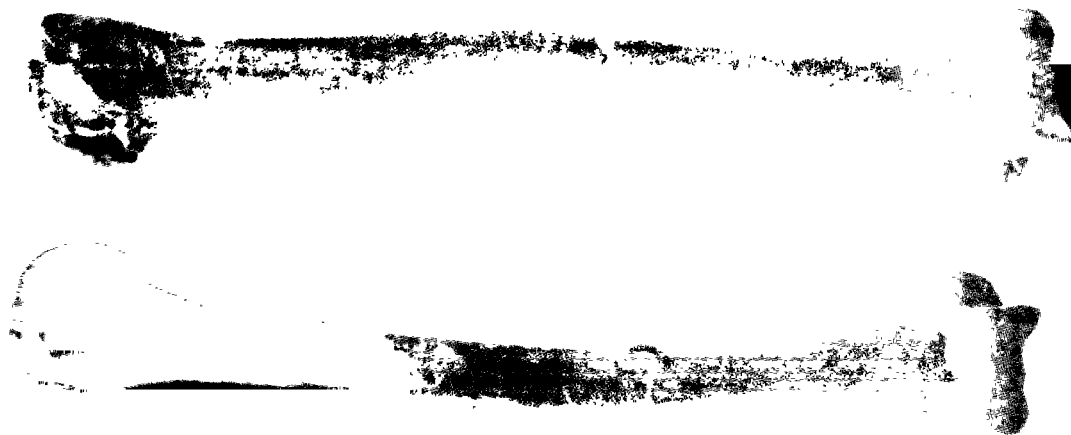


B

A, fibula (right and left); B, cranium norma lateralis, Burial II.
See pp. 159-160



A



B

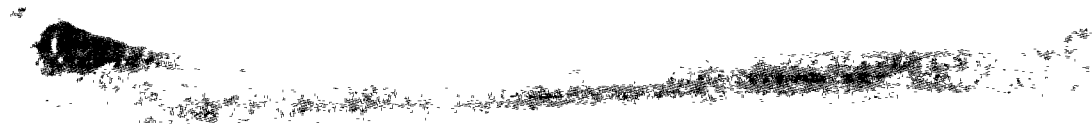
*A, cranium norma lateralis, Burial II;
B, humerus (right and left). See pp. 160-161*



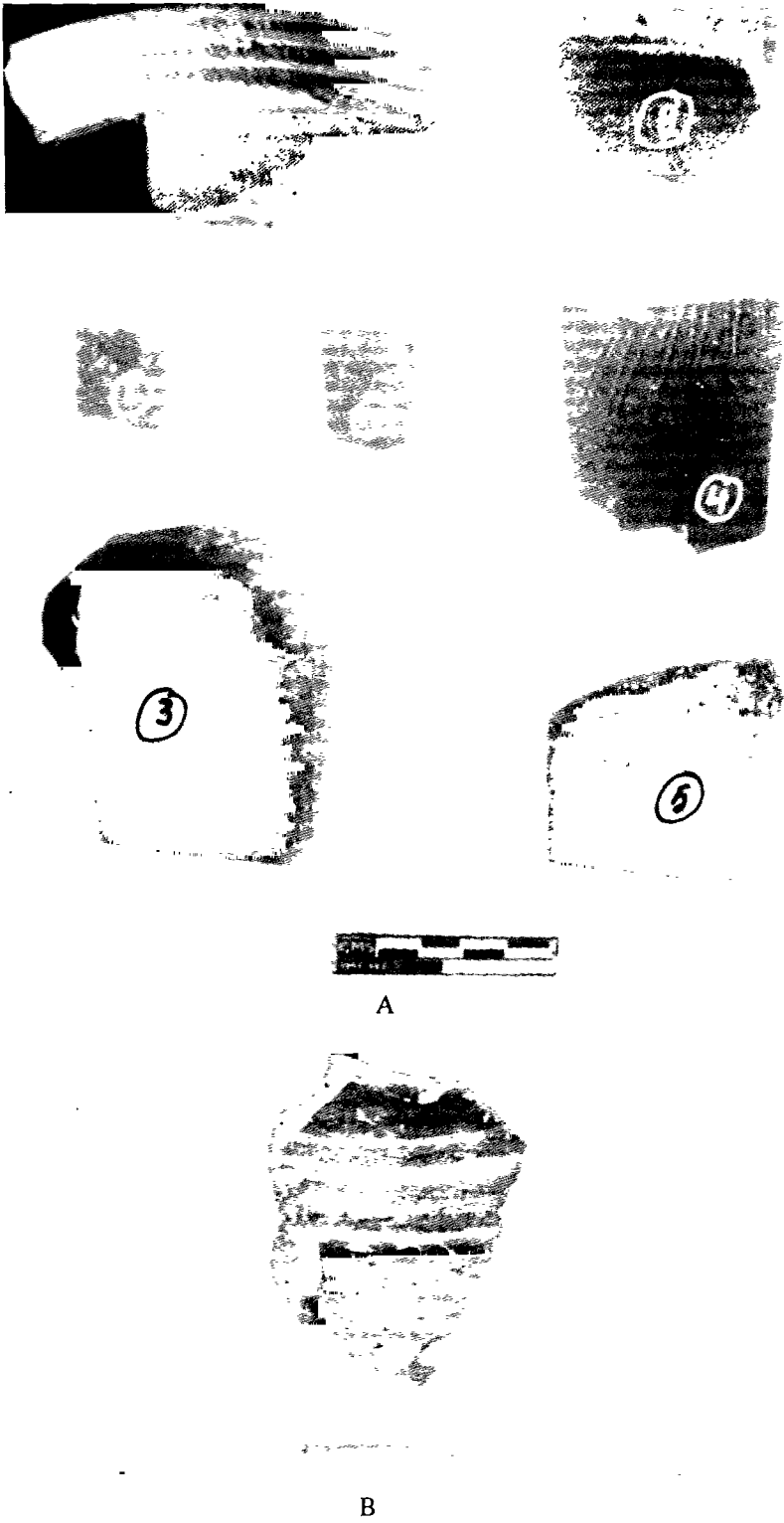
A



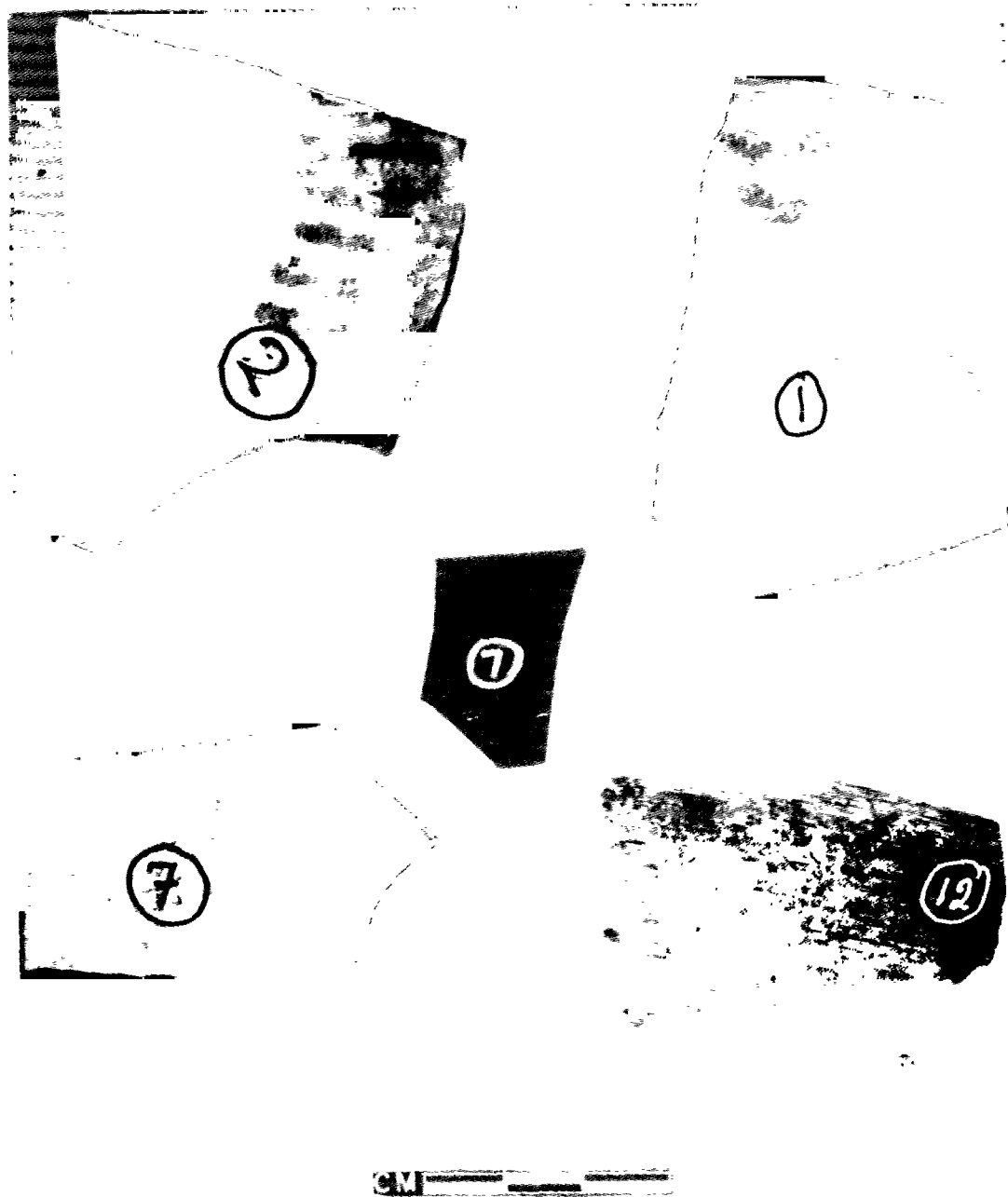
B



A, radius (right and left); B, femur (right and left). See pp. 161-162



Pottery: red ware external appearance with marks.
See p. 209



Pottery : grey and black wares, external appearance with marks. See p. 209



A



B



C



D

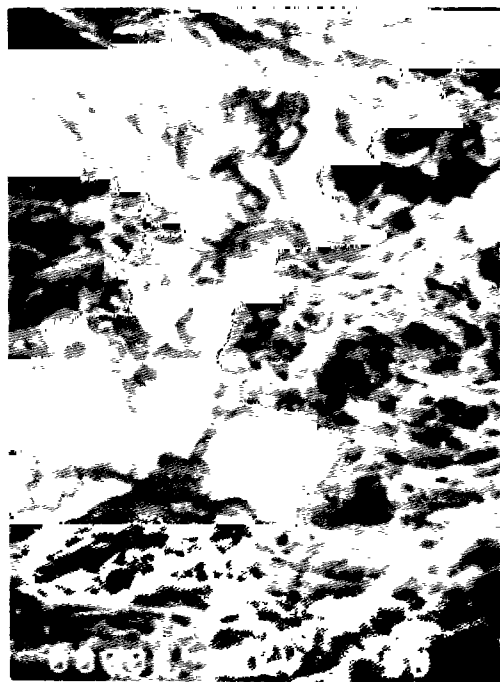
Scanning electron micrograph: A, sample pottery no. 12, needle shaped elongated crystal, magnification 1.1K; B, magnification 2.2 K; C, magnification 2.3 K, quartz crystal enlarged due to accumulation of other impurities; D, pottery sample no. 7, magnification 1.5 K, scales showing probability of fine clay particles arranged one upon other. See p. 214



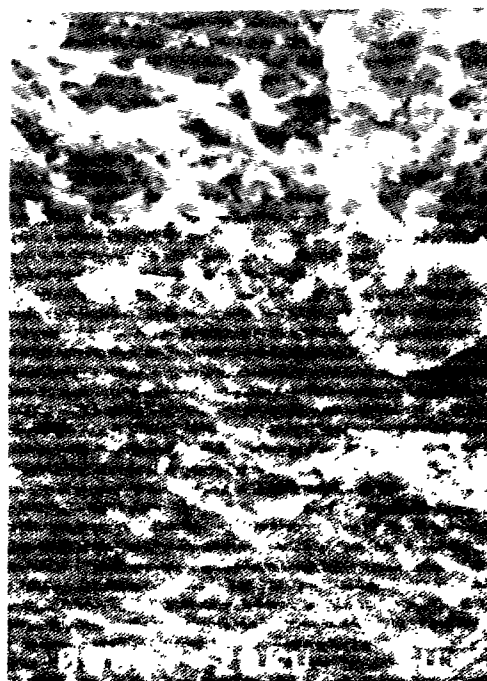
A



B

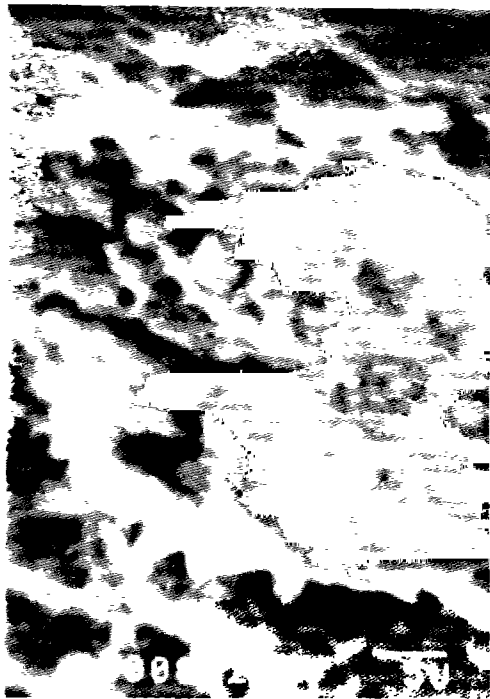


C

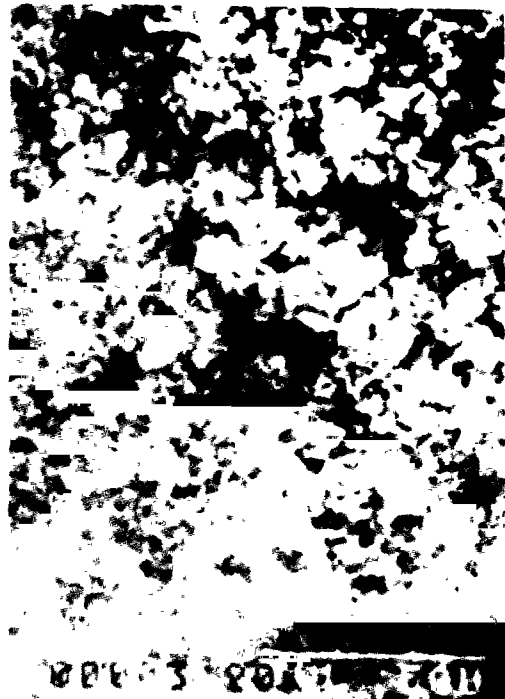


D

Scanning electron micrograph: A, pottery sample no. 7, magnification 1.5 K, showing quartz crystals; B, sample no. 7, magnification 1.0 K, showing quartz; C, sample no. 8, magnification 1.0 K, elongated crystals; D, sample no. 8, magnification 1.0 K, showing distortion of structures. See p. 214



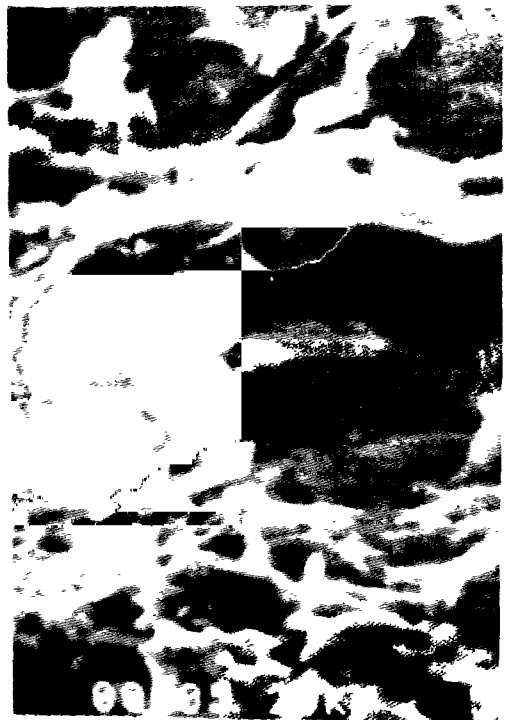
A



B



C

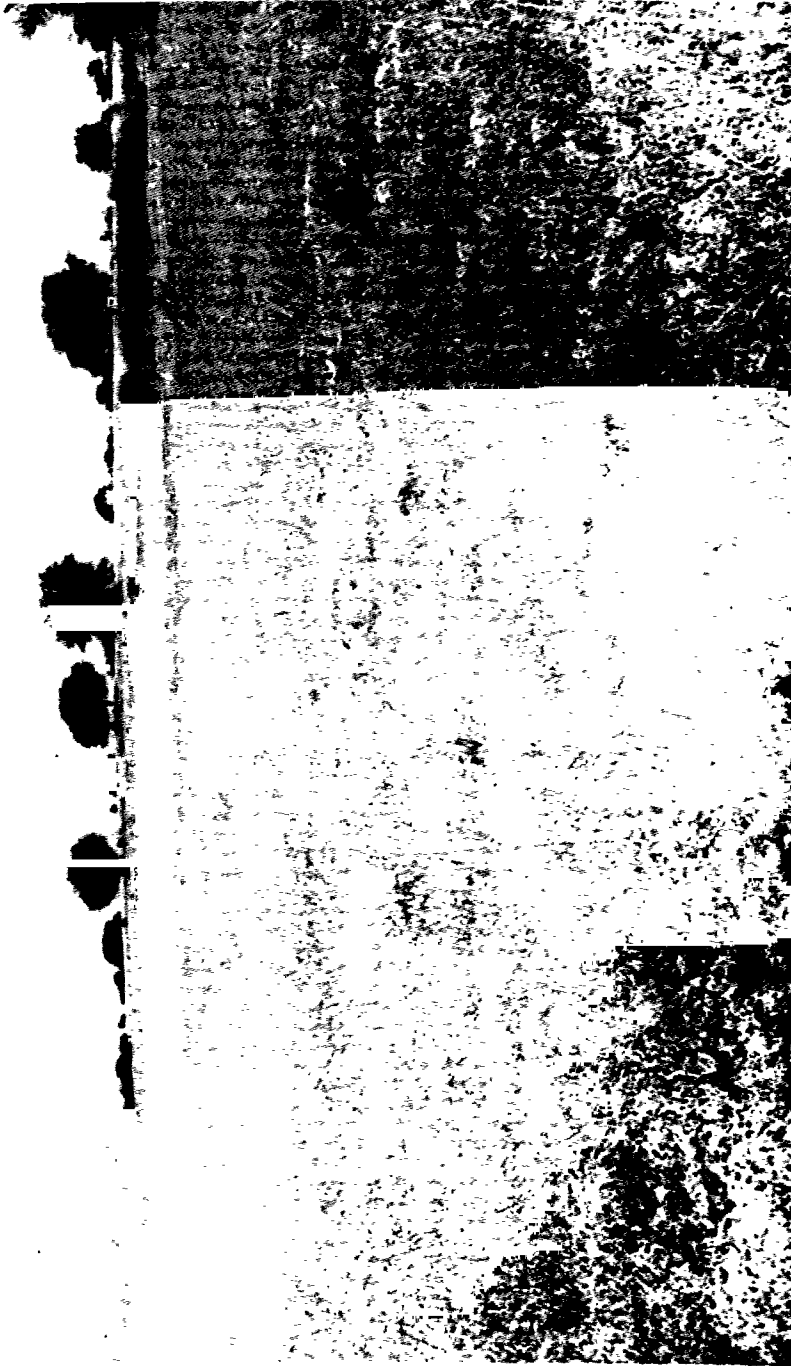


D

Scanning electron micrograph: A, pottery sample no. 8, magnification 2.0 K; B, sample no. 6, magnification 600 X quartz crystal confirmed; C, sample no. 6, magnification 680 X; D, sample no. 6, magnification 2.0 K, quartz crystal confirmed. See pp. 214



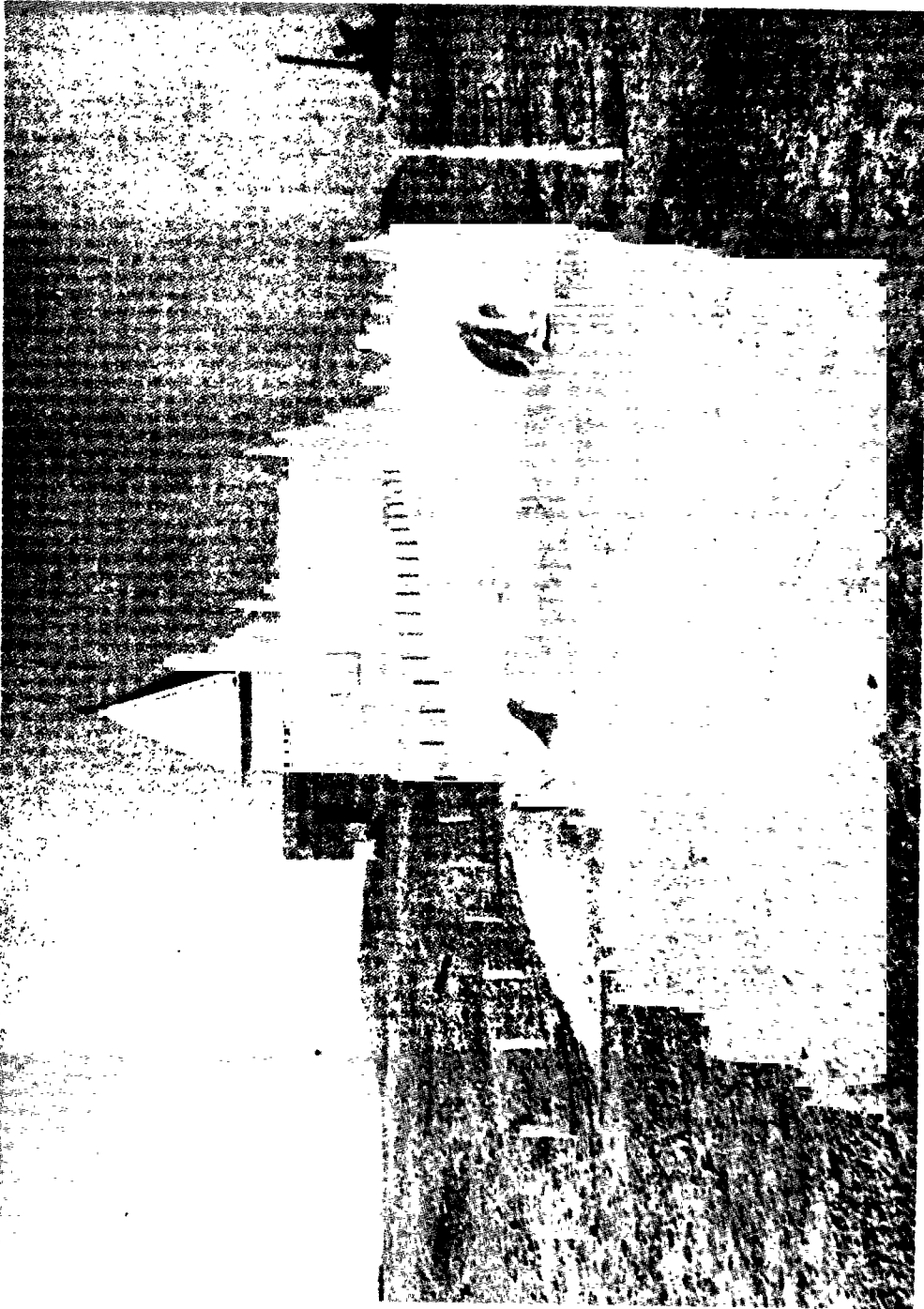
Dhalewan : general view. See p. 233



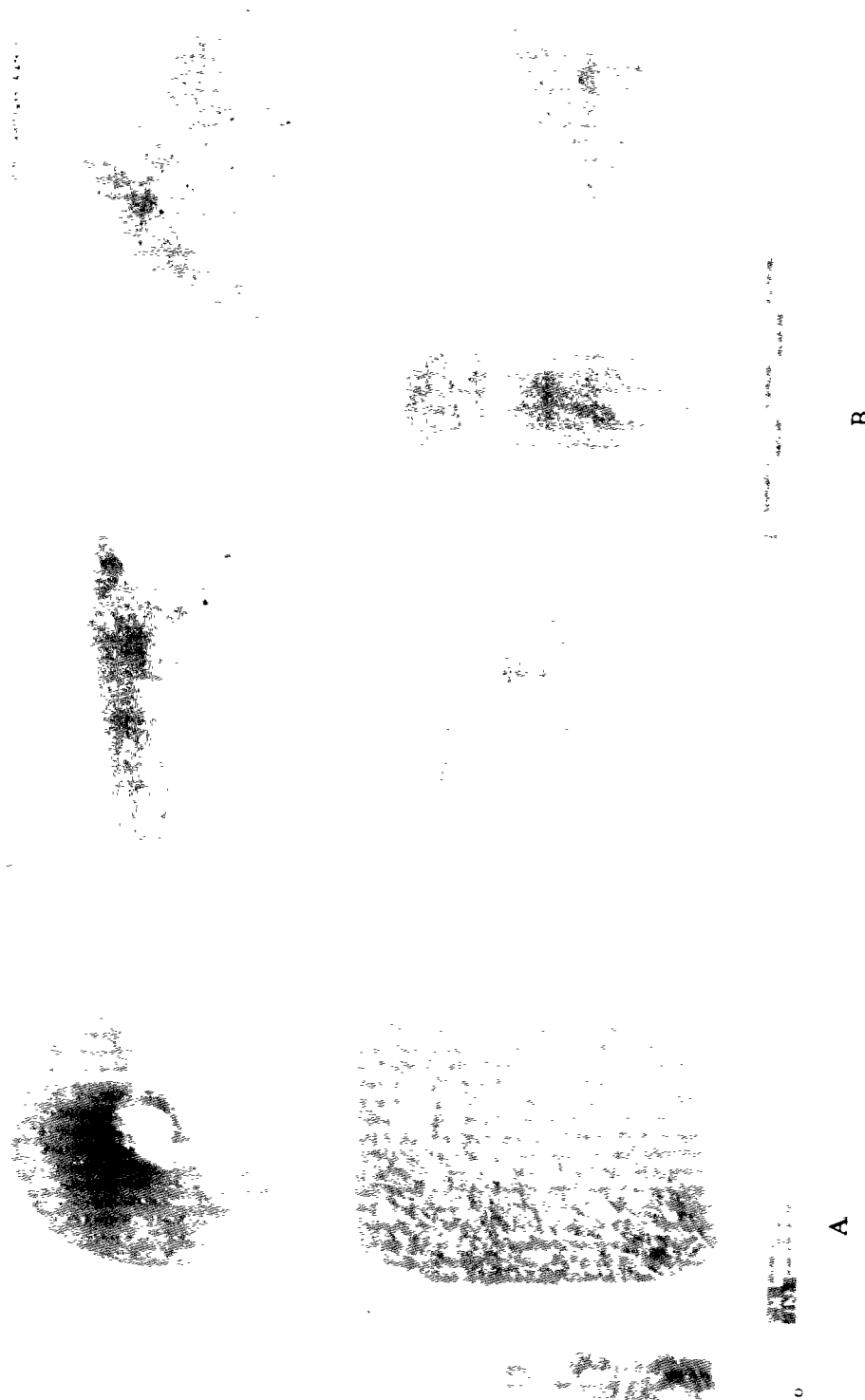
Baglian-Da-Theh : general view. See p. 234



Lakhmirwala : general view. See p. 235



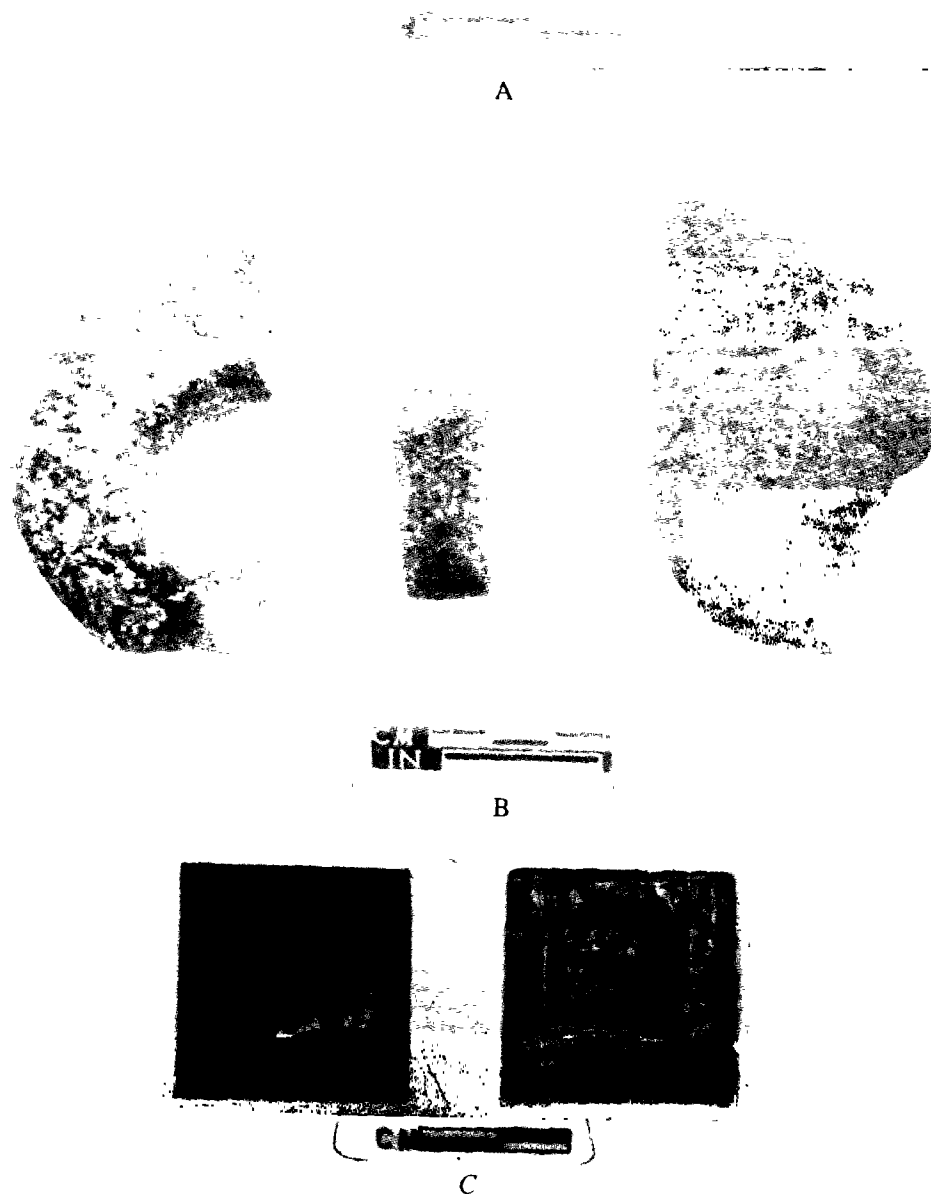
Kasital : general view, before excavation. See p. 237



Kashtal : Antiquities, A, from PGW levels, B, from medieval level. See p. 237



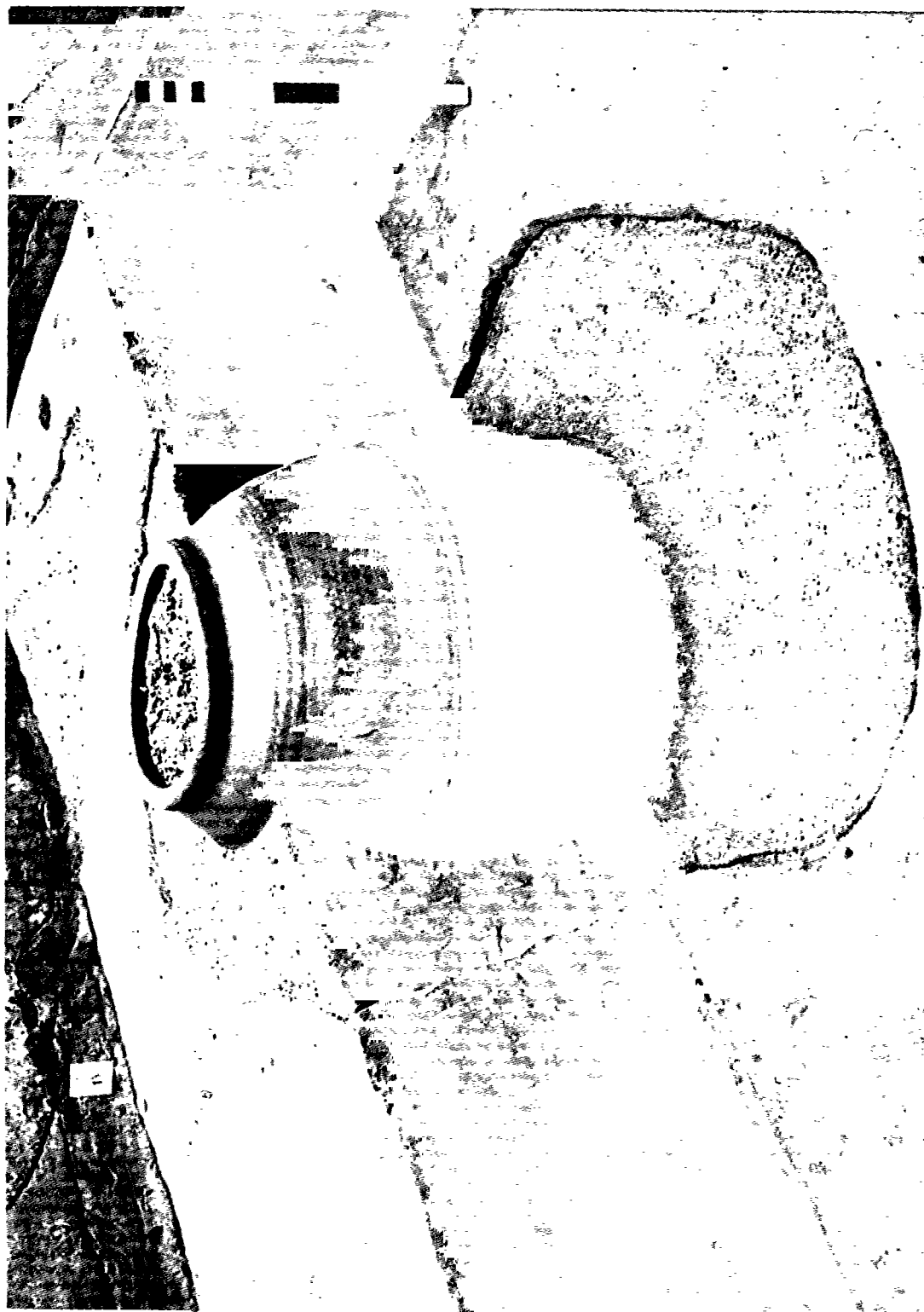
Manda : general view of the excavated remains See p. 239



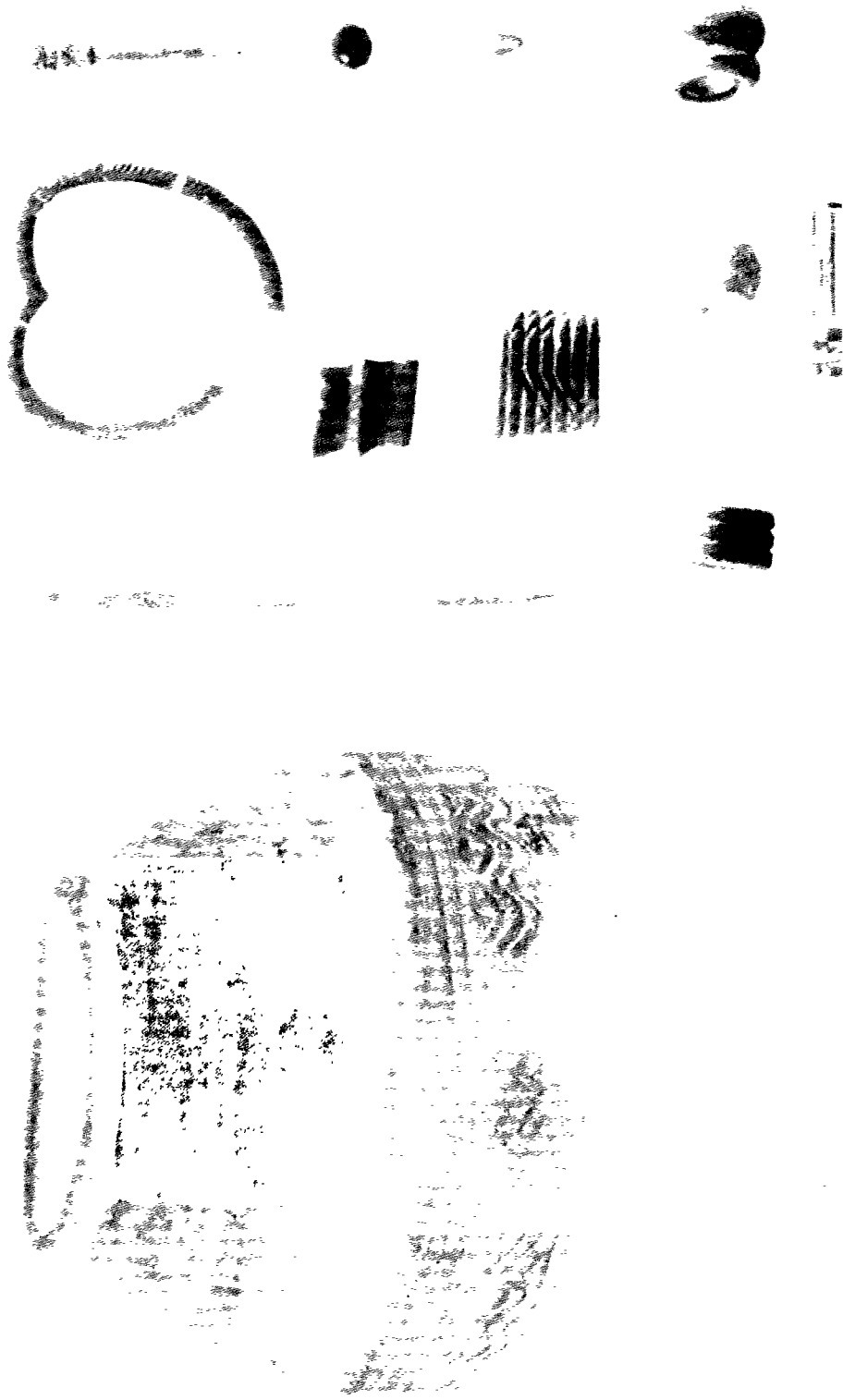
*Manda : A, copper spiral pin; B, fragmentary terracotta objects;
C, unfinished seal. See p. 241*



Dadheri : Structures of Sub-period IA and IB. See p. 244



Dadheri : Late Harappan jar embedded in a pit. See p. 244



B

A

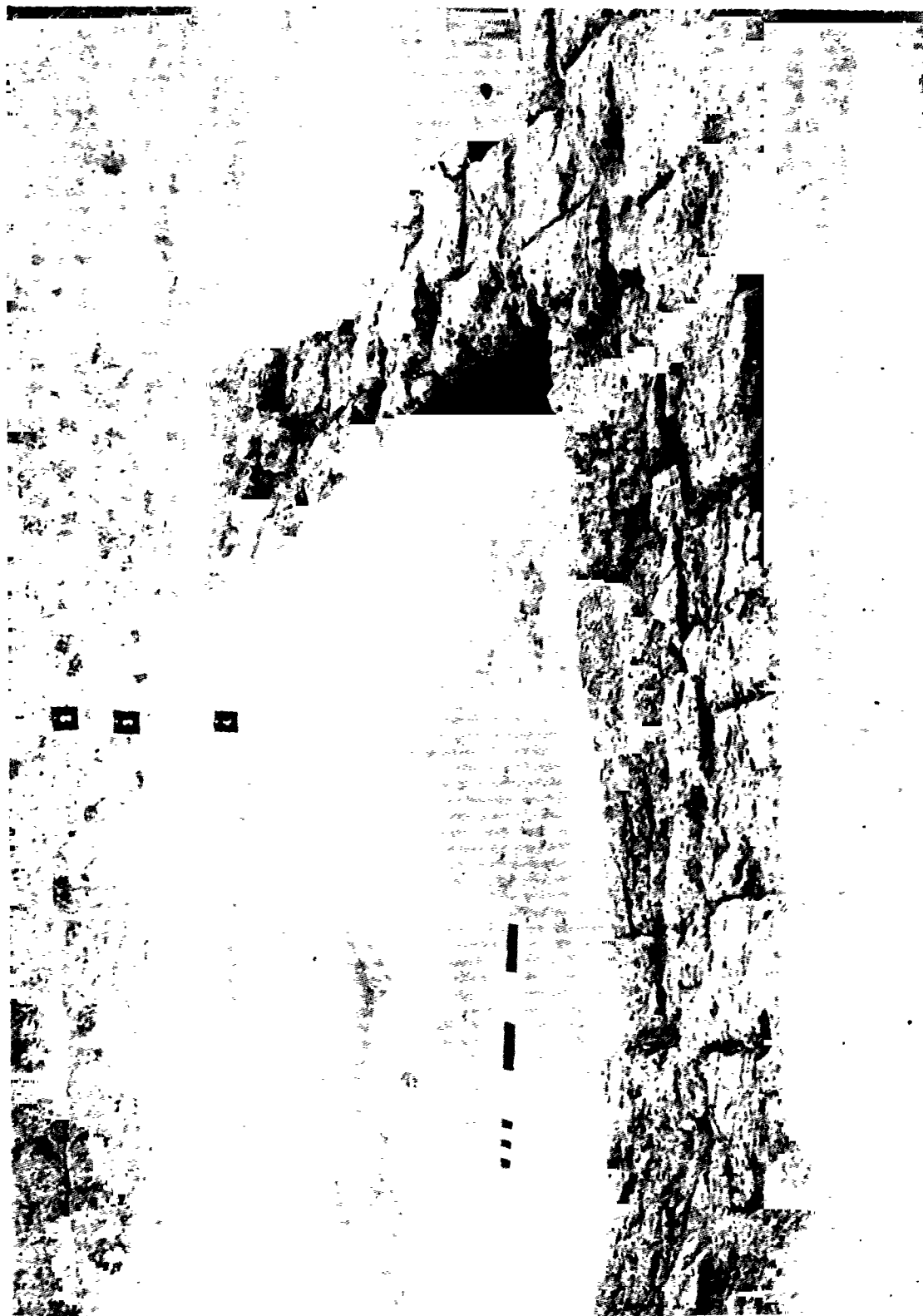
Dadheri : A, a Late Harappan jar ; B, excavated antiquities. See p. 244



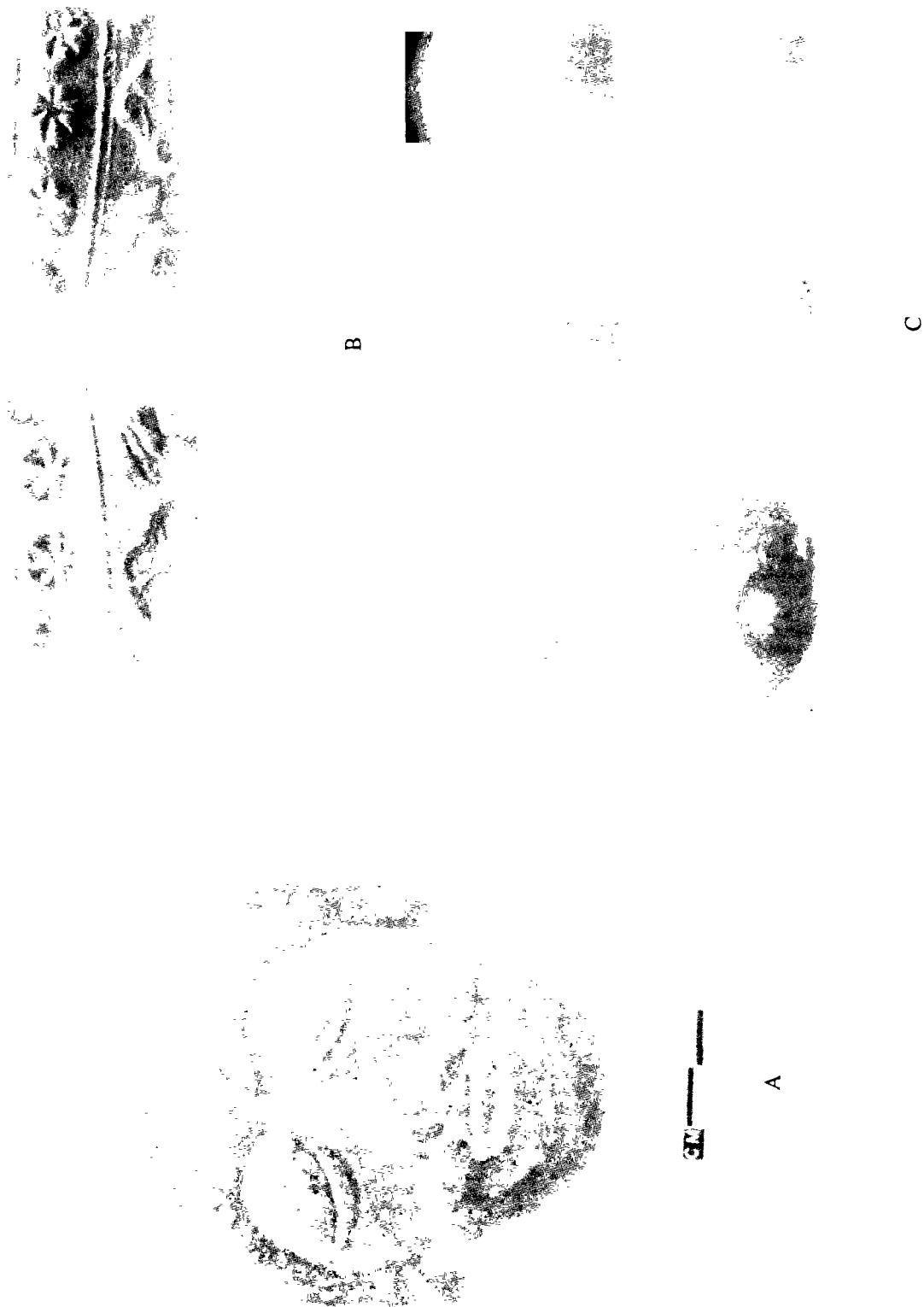
Nagar : oval structure, Period I. See p. 245



A
B
Nagar: A, excavated antiquities, Period I; B, terracotta seal, Period II. See p. 245



Nagar: partially exposed walls of a room, medieval period. See p. 245



Katpalon : excavated antiquities. See p. 245



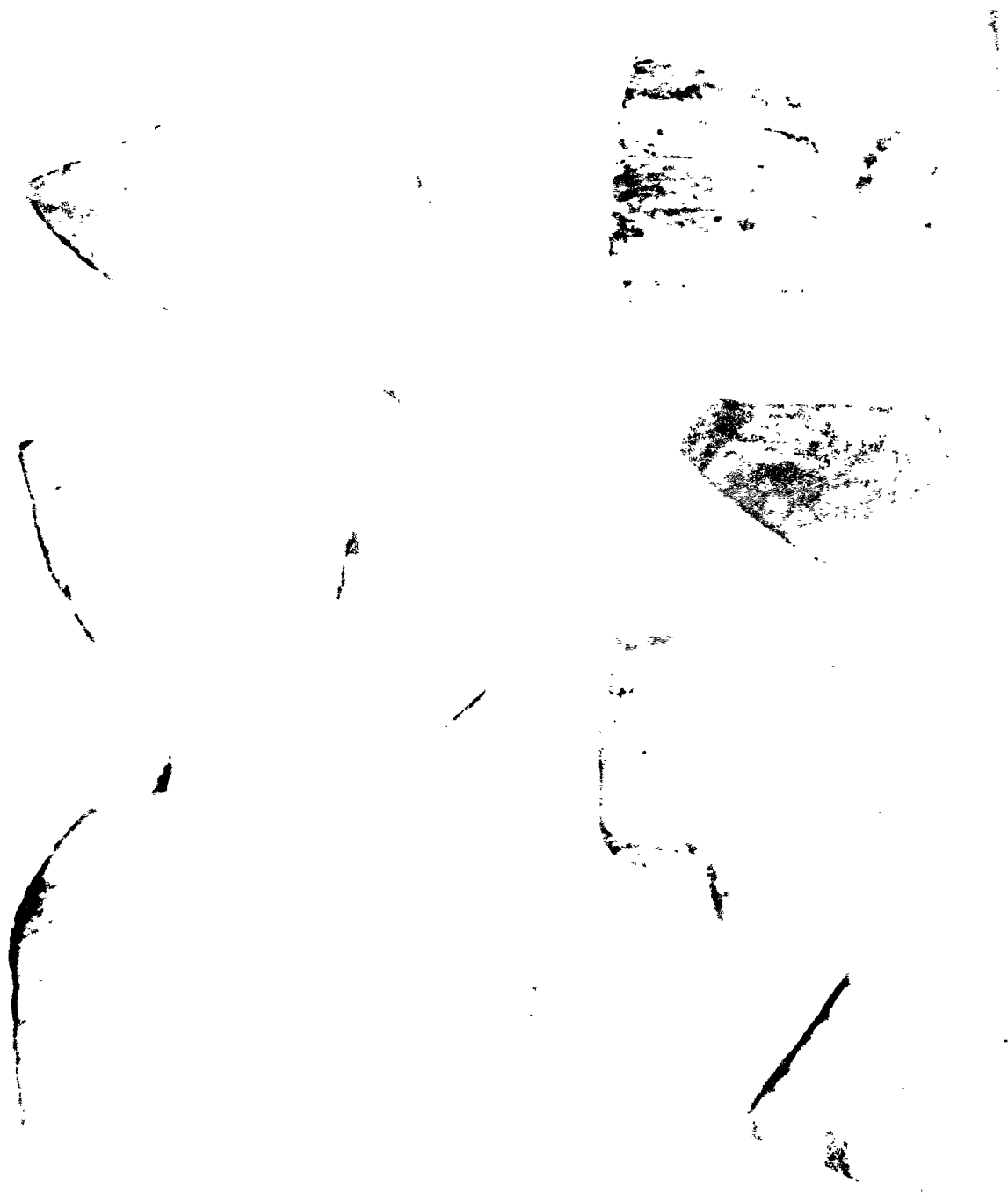
Painted red ware designs, Sub-period IA and IB. See p. 85



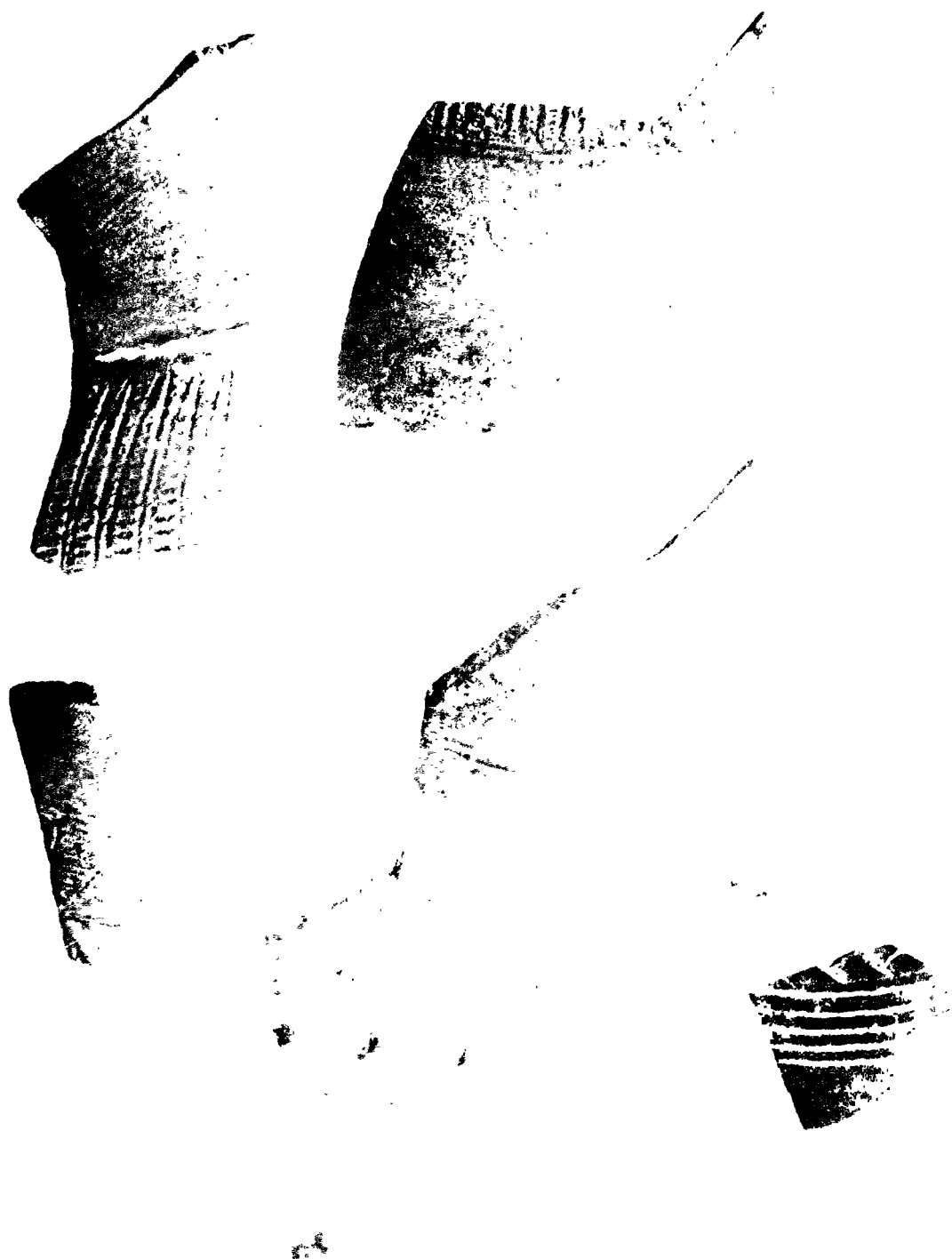
Painted red ware designs, Sub-period IA and IB. See p. 85



Painted red ware, Sub-period IA and IB. See p. 87



Painted red ware: Sub-period IA and IB. See p. 87



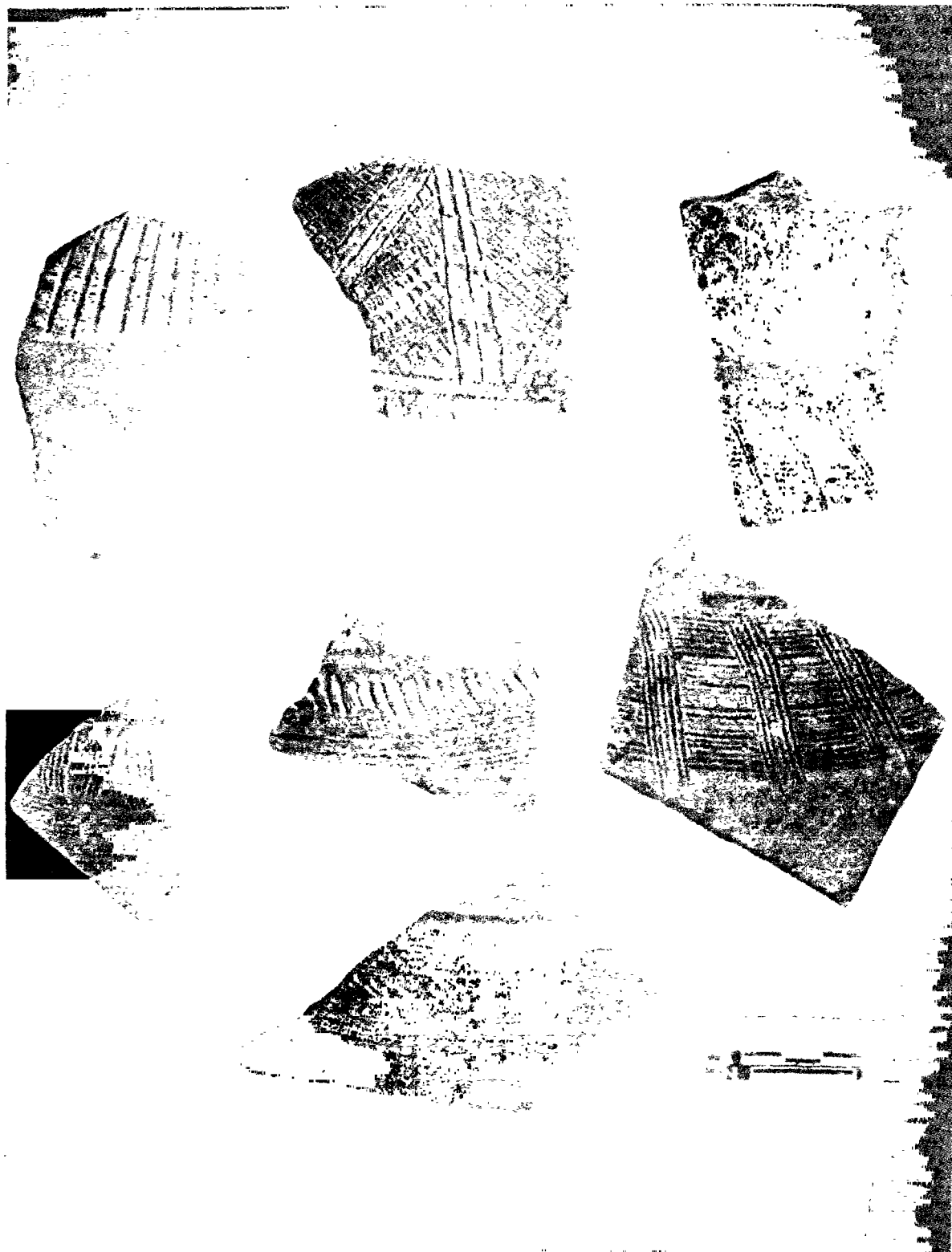
Incised red ware: Sub-period IA and IB. See p. 90



Incised red ware, Sub-period IA and IB See p 90

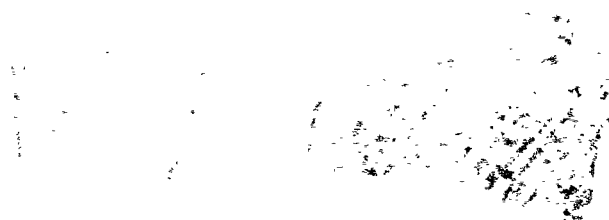


Incised red ware, Sub-period IA and IB. See p. 92

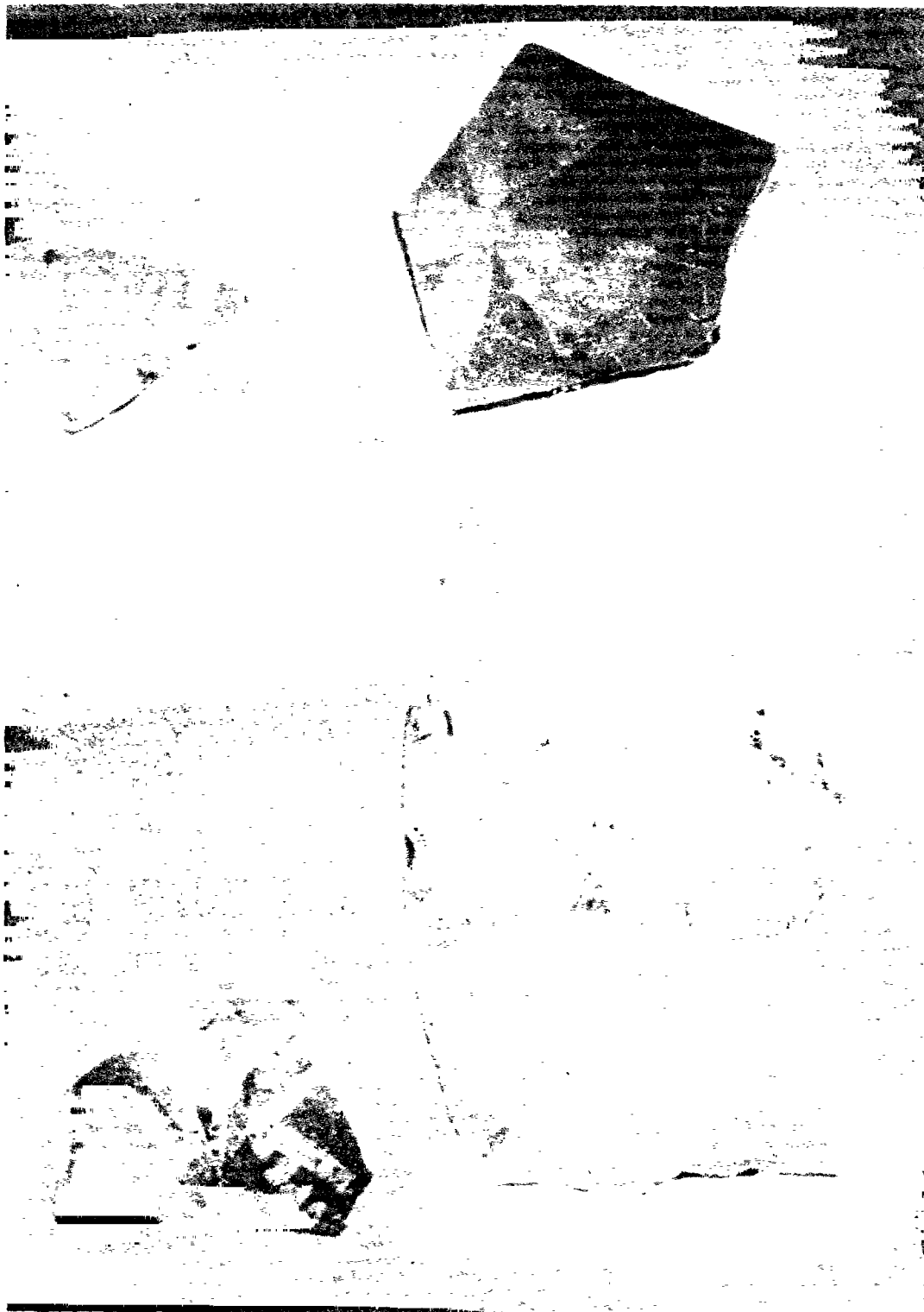


Incised red ware, Sub-period IA and IB. See p. 92





Incised red ware, Sub-period IA and IB See p. 94



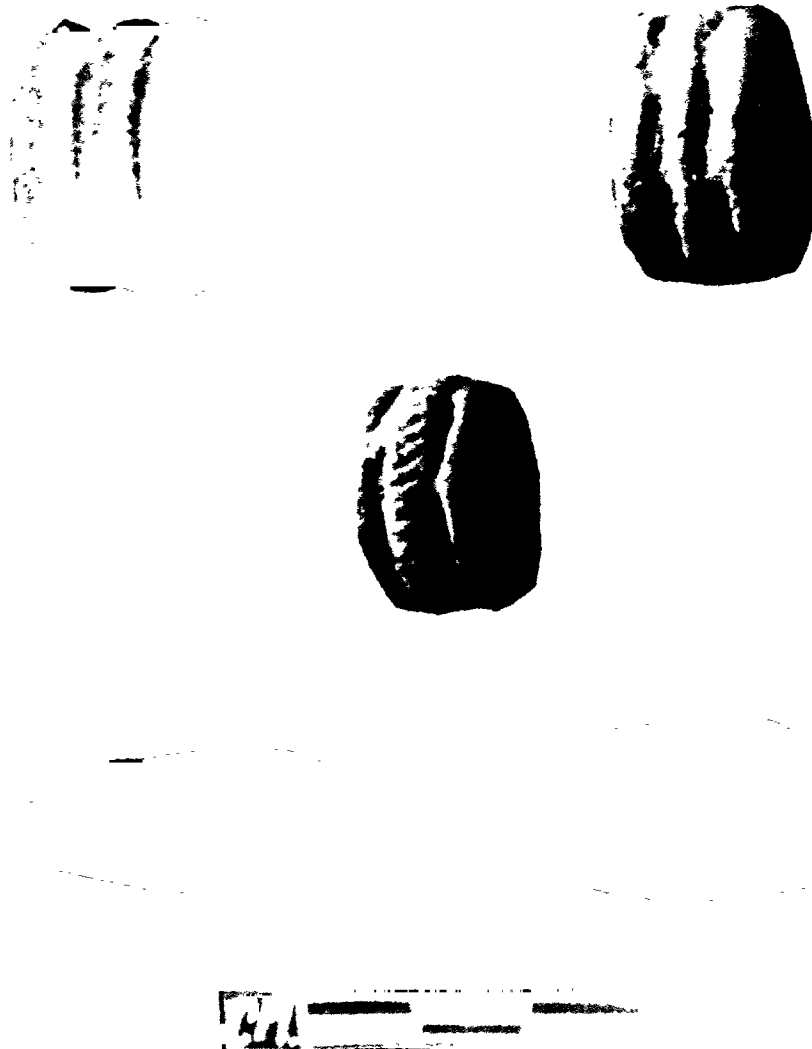
Painted Grey Ware, Sub-period IB See p. 105



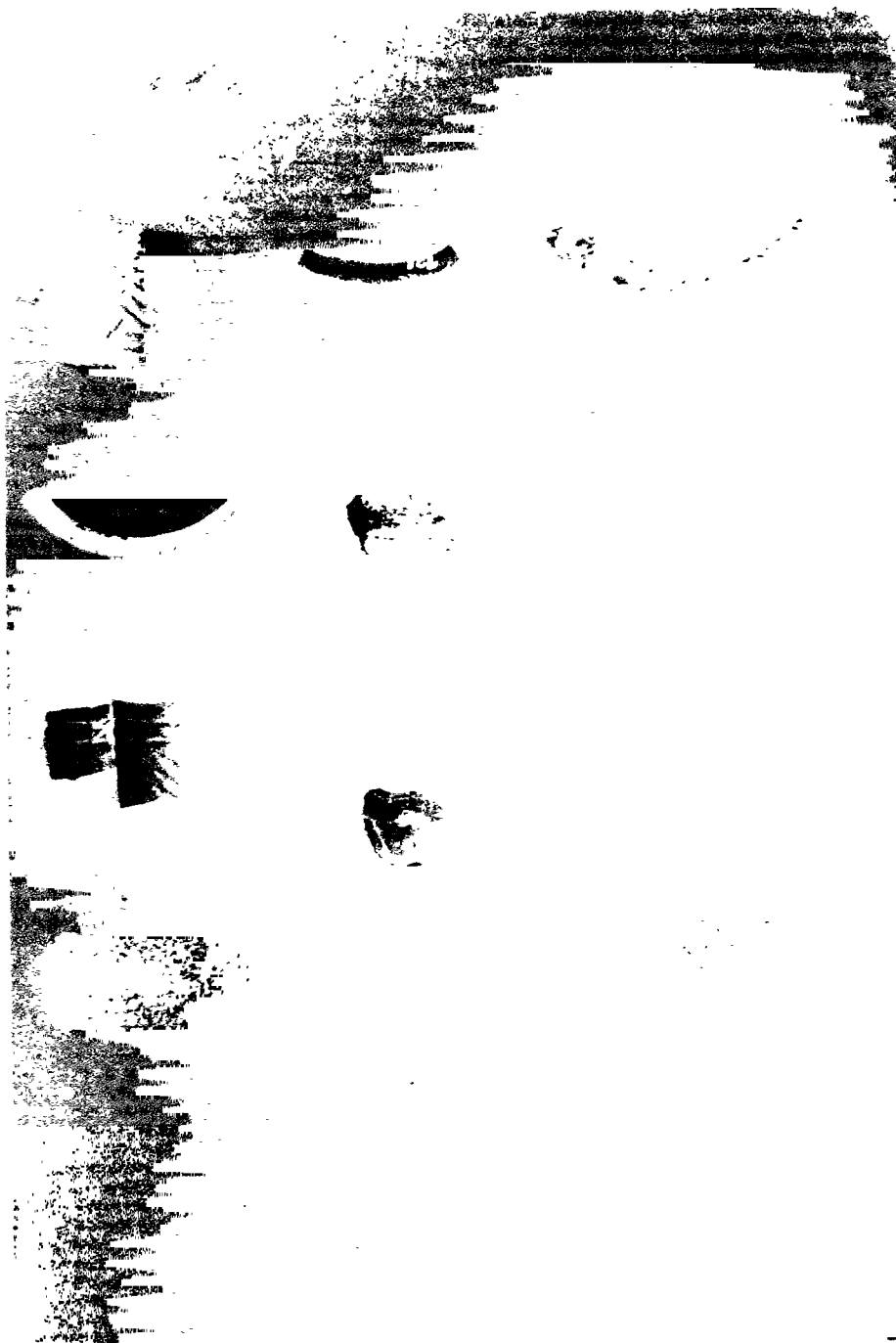
Beads. See p. 118



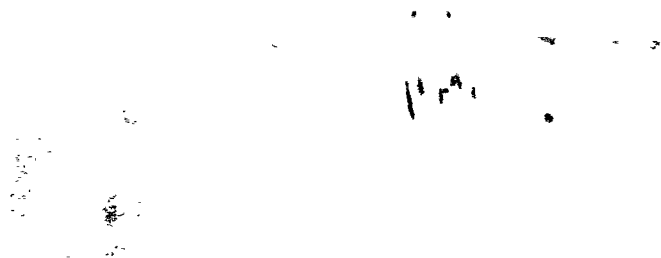
Beads. See p 120



Beads. See p. 122



Bangles. See p. 124



A



B

Bones of sheep and goat. See p. 146



3-2-2

