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# SARAI NAHAR RAI MAN: THE FIRST AND OLDEST HUMAN FOSSIL RECORD IN SOUTH ASIA

*ABSTRACT. — This study reports on the first and oldest definite evidence of fossil human find in South Asia. It is also the only oldest fossil hominid record in the Indian subcontinent. The human skeletal remains were found buried in the pedocalic horizon at a site near the village Sarai Nahar Rai in Pratapgarh District of Uttar Pradesh, India. Geologically the find dates back to the beginning of the Holocene epoch and radiometrically to 10,345 ± 110 years before the present. It further reports on the results of a fresh investigation in skeletal biology of the fossil by collating information on geology, climate, fauna, vegetation, associated finds and the behavioural pattern preserved at the Sarai Nahar Rai site yielding the fossil human record. Two characters of the skull call for special attention in the context of human palaeontology. The first one is the meeting of the anterior root of arcus zygomaticus with the mesial margin of the first premolars. And the second is the markedly thick coating of enamel on the generally large teeth.*

*KEY WORDS: Sarai Nahar Rai Man — fossil hominid — Pratapgarh — India — South Asia.*

## INTRODUCTION

A team of the Anthropological Survey of India, headed by the author, excavated well-preserved human fossil remains from the site Sarai Nahar Rai in Uttar Pradesh, India, in March 1970. The discovery brings to light, for the first time, evidence of oldest fossil record of *Homo sapiens sapiens* in South Asia. The discovery is of crucial importance in understanding the dynamics of evolutionary biology of human groups in South Asian context.

Furthermore, the find becomes eminently important for South Asia in the context of the following facts. In this part of the world earliest record of fossil hominoids is from the Sivalik Hills of northern India and Pakistan. The fossil remains representing some 50 individuals, belonged to a number of genera. They include *Ramapithecus* (= *Sivapithecus*) and *Gigantopithecus*. After a brief blossoming, the hominoids disappeared from the Sivaliks when the region experienced a cooler climate during eight to six million years ago. Since then and until the beginning of Holocene to which the present human fossil belonged, the entire region of South Asia remains yet a blank. Although behavioural evidence of hominids are abundantly available throughout the greater span of middle and late Pleistocene, no record of fossil man during the period is available, excepting for a lone find. The find is that of a broken right temporal bone of a Neanderthal man recovered from a Mousterian site at Darra-I-Kur in the foothills of the Hindu Kush in eastern Afganistan. This Pleistocene fossil hominid bone was obtained from a cultural deposit dated to 30,000 ± 1900 to 1200 years B. P. (Dupree, 1972; cf. Kennedy, 1975).

Considering the facts just stated, the human fossil discovered at Sarai Nahar Rai becomes obviously vital as far as the aspect of human palaeontology in South Asia is concerned. Although described earlier (Dutta, 1971, 1973; Dutta and Pal, 1972; Dutta, Pal and Biswas, 1972; Dutta, Pal and

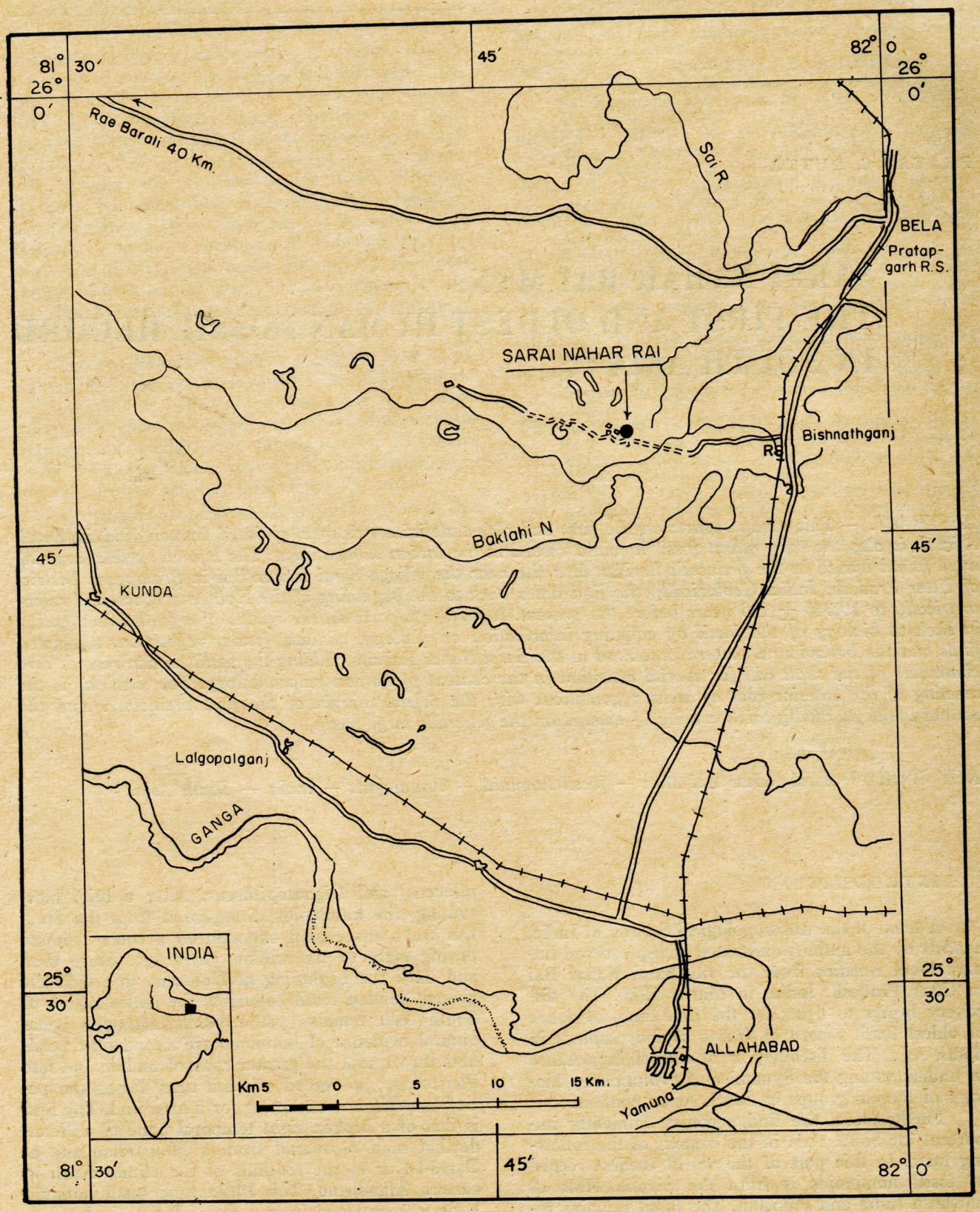


FIGURE 1. *Location map of the human fossil bearing site at Sarai Nahar Rai.*

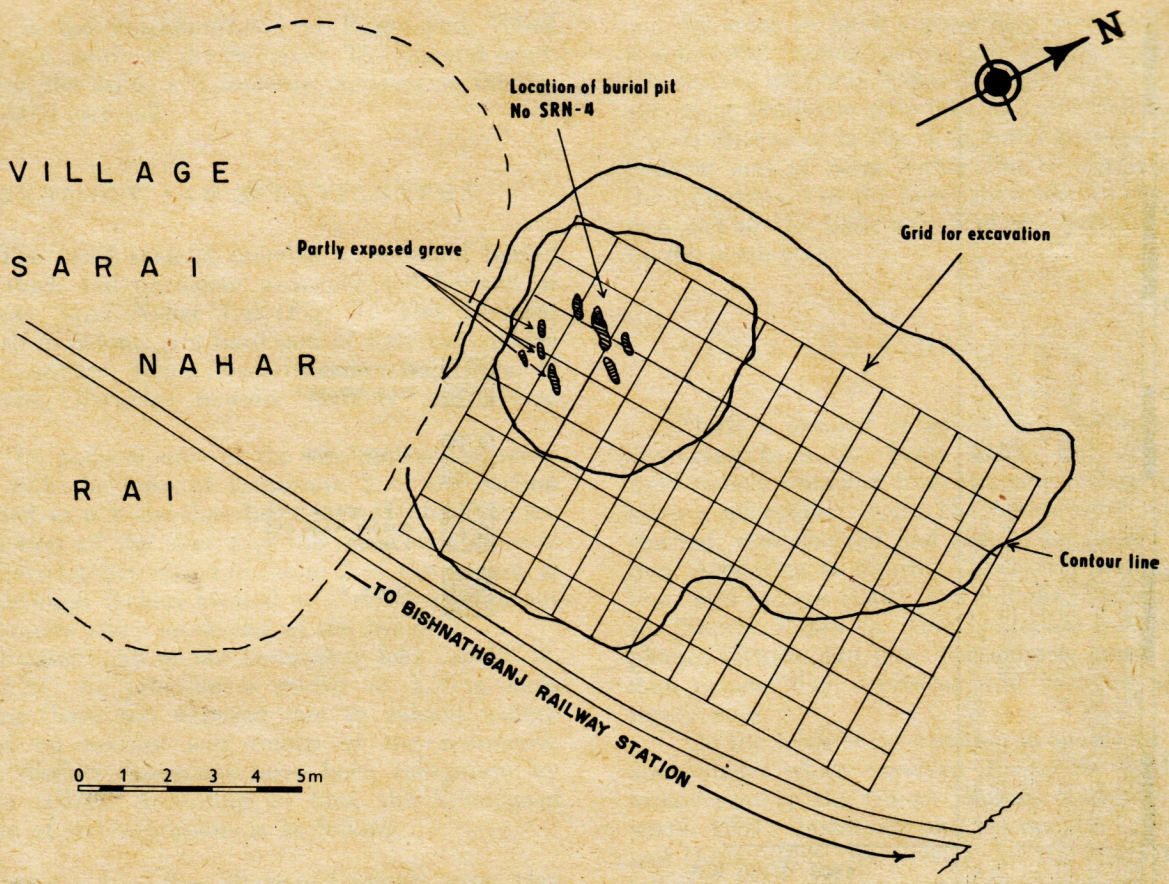


FIGURE 2. *Plan of the site showing location of burial pit No. SRN-4 and partially exposed graves.*

Dutta, 1971), the material calls for a further attention for its fuller documentation and a thorough investigation.

This paper, therefore, attempts to record in detail (I) information available concerning the Sarai Nahar Rai site and finds therefrom, and (II) the results of further investigations on them.

## THE SITE

The locality (25°48′ *N*, 81°50′30″ *E*), yielding the human fossil find, lies immediately to the east of the village Sarai Nahar Rai. It is about 38 km north of the l.c. City of Allahabad and about 23 km south-west of the town of Pratapgarh, as the crow flies *(Fig. 1)*. The site is within the pargana Pratapgarh which occupies the central portion of Pratapgarh District (between 25°34′—26°11′ *N* and 81°19′ — 82°27′ *E*) in the state of Uttar Pradesh, India. The site, situated in the Middle Ganga Valley, was located by the State Archaeological Department of the Government of Uttar Pradesh, Lucknow, in 1968.

The site is a slightly rising ground, rather a very low mound *(Fig. 2)*. It encloses an area of about 2700 m$^2$. Eastern part of the site, which is roughly 600 m$^2$ in area, has been highly eroded and badly damaged, exposing visible evidence of a cluster of human graves. Seven badly damaged and partially exposed graves could be identified there in west to east direction.

## SURFACE FEATURES

The area lies on the plains of the Ganga, and it is well wooded. The chief river is the Sai, flowing across the northern half of the region. The river Sai and its affluents are specially important for the drainage of the region. There are many meander lakes (horse-shoe type) and swamps throughout. A narrow trail of an affluent of the Sai, locally known as the Belkhari Nahar, is present immediately to the north-east of the site, about a kilometre away. The soil is composed of younger (Gangetic) alluvium, its ingredients being mainly sand, silt and clay. It forms a monotonous and flat topography with an average altitude of 914.4 m above the sea level. The older alluvium contains deposits of calcium carbonate in the form of irregular nodules, commonly known as *kankars*. It is found in beds all over the district, specially in the *usar* tracts. Salt-earth and salt-wells occur in many places, spe-

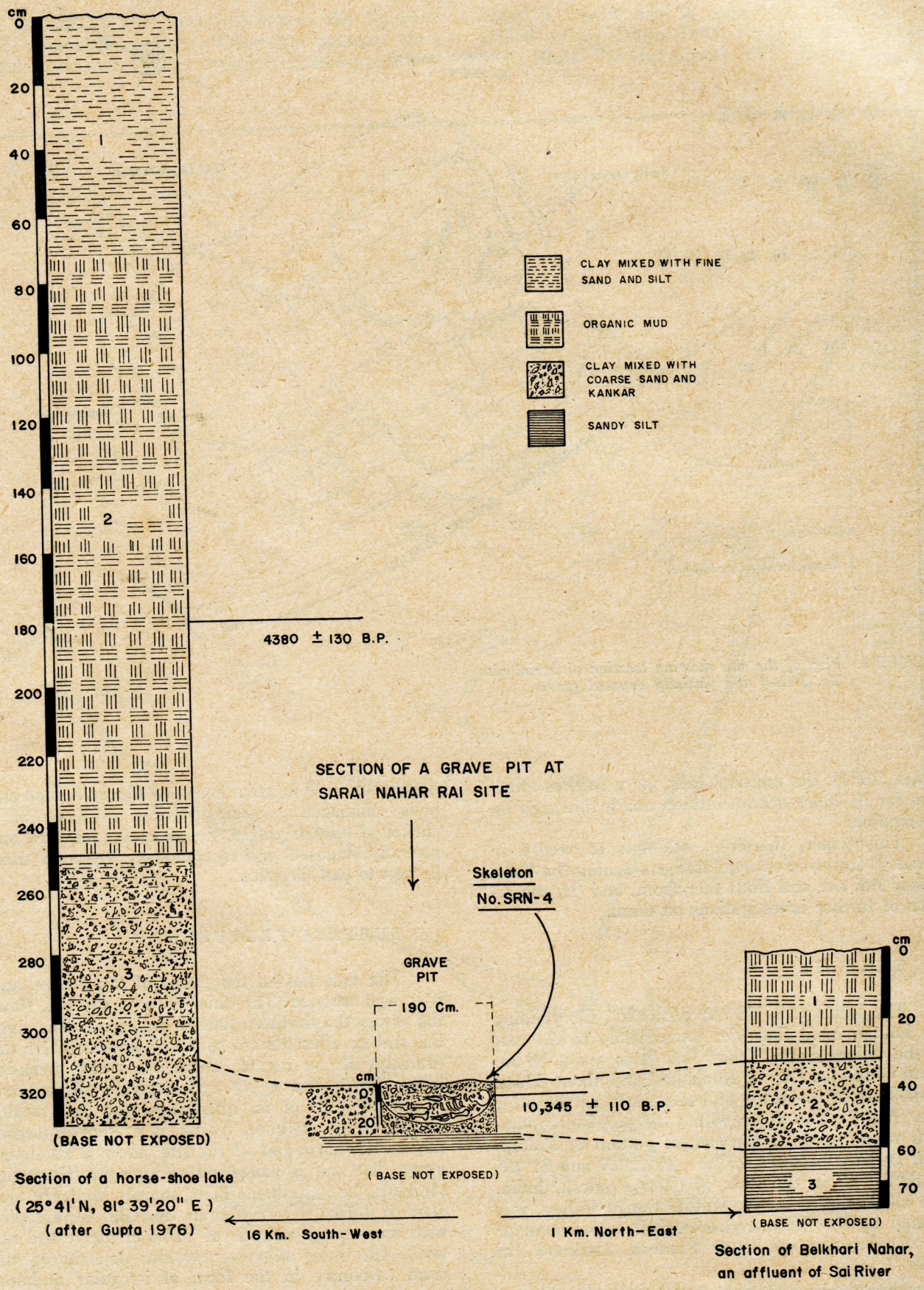


FIGURE 3. *Sections of Sarai Nahar Rai site and the adjoining areas.*

cially in the neighbourhood of Pratapgarh Tahsil along the course of the Sai river. The mineral product *reh*, the saline efflorescence, appears on the uncultivated *usar* soil.

## GEOLOGY AND STRATIGRAPHY

The fossil skeletal remains were found buried in a thick and persistent pedocalic soil horizon at the site Sarai Nahar Rai *(Fig. 3)*. This horizon, greyish in colour, is a hard pan of lime concretions with variable amounts of angular fragments of quartzite, irregular nodular *kankars* and coarse sand.

The pedocal unit of the site appears correlatable with the base of Lithozone 3 of the section exposed at a horse-shoe lake, located about 16 km south-west of the site. And the same unit appears also correlatable with Lithozone 2 of the section at the Belkhari Nahar, located at a distance of about a kilometre away north-east of the site *(Fig. 3)*.

Stratigraphy of the horse-shoe lake (25°41′ *N*, 81°39′20″ *E*) provides a profile of 3.30 m deep section (base not exposed due to subsoil water). Based on texture and colour of the sediments, three distinct lithozones have been recognised by Gupta (1976). According to him, the lithological profile of sedimentations is as follows:

Lithozone 1 : 0— 70 cm — Compact grey clay with fine sand and silica;

Lithozone 2 : 71—250 cm — Dark black organic mud mixed with very fine silt; and

Lithozone 3 : 251—330 cm — Grey sticky clay with loose and coarse sand and silica. Irregular nodular *kankars* are present and these are more frequently found towards the lower limit.

Stratigraphy of the Belkhari Nahar, as observed by the author, furnishes a 75 cm thick profile (base not exposed). On the basis of texture and colour of sediments, profile of the section may be described as follows:

Lithozone 1 : 0—32 cm — Dark compact clay of hard organic mud;

Lithozone 2 : 33—60 cm — Grey sticky clay with lime concretions with variable amounts of quartzite fragments, irregular nodular *kankars* and coarse sand; and

Lithozone 3 : 61—75 cm — Dark-yellowish sandy-silt.

In order to have a good idea of the situation, a schematic section across the region, correlating the section of Sarai Nahar Rai site with those observed at the horse-shoe lake and the Belkhari Nahar, is illustrated in *Fig. 4*. It could be seen that the pedocal unit of Sarai Nahar Rai is correlatable to the Lithozone 3 of the horse-shoe lake on the south-east and to the Lithozone 2 of the Belkhari Nahar on the north-east.

## FAUNA AND FLORA

Quite a number of animal bone remains were recovered from the Sarai Nahar Rai site. These were mostly obtained from deposits in hearths containing microlithic tools. The bones were found in charred, semi-charred and also in uncharred condition. According to Sharma (1975), the bones represent: *Bos indicus* (Cow), *Bos bubalis* (Buffalo), *Ovis* sp. (Sheep), *Capra* sp. (Goat), *Elephas indicus* (Elephant), tortoise and fish. The animals larger in size than present day, represent wild varieties, not domestic ones.

On the basis of information available on faunal assemblages which survived during the Early Holocene time in the Ganga-Yamuna Valley (Chakravorty, 1931; Dassarama and Biswas, 1976; Satsangi and Dutta, 1968), the presence of the following vertebrates may also be suggested. These are: *Equus onager khur, Elephas maximus, Bos gaurus, Gazella* sp., *Antilope* sp. (Black buck), *Cervus* sp. (Deer), *Canis* sp. (Fox/Dog), *Hystrix* sp. (Porcupine), *Mus* sp. (Field rat), etc.

Floristically, the area is characterised by Tropical Dry Deciduous Savannah Forest (Champion and Seth, 1968). The type of vegetation is open savannah with predominance of grasses. Scattered stands of trees and bushes could be seen over the low grasses.

Recently, a pollen analytical investigation of a 3.30 m deep profile from a horse-shoe lake (25°41′ *N*, 81°39′20″ *E*), referred earlier, was carried out by Gupta (1976). The lake is situated about 16 km south-west of the Sarai Nahar Rai site. Its lithological details of sedimentation have already been noted above and illustrated in *Fig. 3*. On the basis of pollen assemblages, the whole pollen sequence has been divided into four major local pollen zones. For the present, our interest lies most with pollen zones HS-I (330—250 cm) and HS-II (250—180 cm) of Gupta. The pollen zone HS-I exactly corresponds with Lithozone 3, while HS-II corresponds with the basal part (between 180 to 250 cm) of Lithozone 2 (cf. *Fig. 3*).

The study indicates that pollen were very scarce in Zone HS-I due to increased salinity. Five samples of pollen were collected from different levels of this zone. The pollen available from the base of this zone, which is marked by the excessive presence of *kankars* in loose sand, represent Gramineae and *Chenopodium* only. Pollen from the middle-upper limit of this zone have also yielded

exceedingly high values for Gramineae and *Chenopodium*. Again, pollen of Rosaceae, Malvaceae and *Phyllanthus* have been registered in low incidences from this level. *Prosopis spicigera* pollen are present, attaining a maximum of 3 per cent. On the whole, the pollen assemblage of this zone portrays a picture of open grasslands. Tree and shrubby vegetation is very low, and the total arboreal value does not exceed more than 8 per cent.

Zone HS-II differs markedly from Zone HS-I, however. It is characterised by the onset of arboreal vegetation, such as *Anogeissus* and *Tecomella* which were totally absent in the preceding zone. The general vegetation pattern is that of an open steppe in which grasses were predominant.

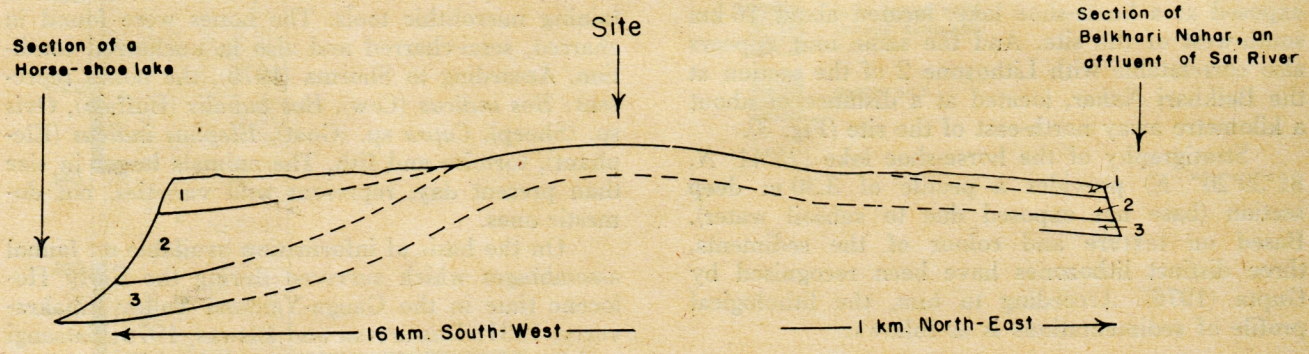


FIGURE 4. *Schematic section across the region, correlating Sarai Nahar Rai with sections recorded at a horse-shoe lake and Belkhari Nahar (reconstructed, not to scale).*

## CLIMATE

Geologically, pedocalic soil develops in arid to subarid conditions (Papadakis, 1969; cf. Dassarma and Biswas, 1976 : 37). The pedocalic soil owed its origin to the widespread aridity during the Early Holocene which followed the post-glacial climatic optimum, almost everywhere in the world.

Palynologically, scarcity of pollen at the base of Zone HS-I, discussed earlier, suggests high degree of aridity and saline conditions resulting in destruction of pollen. In the middle and upper level of Zone HS-I, the presence of *Typha angustata* (a fresh water marshy plant) attests a change in climatic condition.

The faunal assemblage, as already noted, reflects humid to semi-arid climatic condition.

## HUMAN FOSSIL FIND, SKELETON NOS. SRN-4 AND SRN-5

### THE MATERIAL

Digging resulted in the most important yield of an articulated, almost complete skeleton No. SRN-4 from grave No. SRN-4. The yield also includes a collar bone of another skeleton No. SRN-5 from an adjacent grave pit. Skeleton No. SRN-4 lacks only the mandible and right humerus, owing to the cutting of a pit of a later date. Portions of the right pelvic bone, ribs and some smaller bones of the skeleton are, however, fragmented or disintegrated beyond any scope of reconstruction.

### STATE OF PRESERVATION

Due to pedocalic activity, cellular spaces of all the bones have been filled up with lime solution, resulting in complete fossilisation of all the skeletal material. The outer surface of all the skeletal parts is also incrustrated with lime.

### MORPHOLOGY OF SKELETON NO. SRN-4

#### *Age and Sex*

Estimation of age was based on the features of skull, maxillary dentition and the clavicle bones. Third molars have reached the level of occlusal surface, indicating adulthood. Cranial sutures are mostly open on the outer table, excepting some showing feeble evidence of partial fusion. But the criterion of suture closure for estimating age is not now fully relied upon (Brothwell, 1963 : 38). In this regard, ossification of clavicle is most important for the present case. Examination reveals that epiphyseal union at the sternal end of clavicle is complete suggesting an age of 30 years or more at the time of death.

The degree of dentine exposure might give clues for estimating maturity. The left third molar shows no dentine exposure, while the right third molar displays one slightly worn cusp. The left second molar exhibit dentine exposure on its two cusps, and the right second molar on three cusps. The first molars show that three dentinal areas have been coalesced into one, leaving only one discrete area in each. On the basis of a recent study on modern Indian crania (Pal, 1975), it may be conjectured that abrasion of all the four cusps

TABLE 1. *Measurement of the skull of skeleton No. SRN-4*

| Character | mm |
|---|---|
| Maximum cranial length | 192.0 |
| Maximum cranial breadth | 146.0 |
| Nasion inion length | 167.0 |
| Basi-bregmatic height | 124.0 |
| Auricular height | 115.0 |
| Least frontal breadth | 107.0 |
| Greatest frontal breadth | 121.0 |
| Bizygomatic breadth | 145.0 |
| Nasion basion line | 96.0 |
| Nasion prosthion line | 62.5 |
| Nasal breadth | 26.0 |
| Nasal height | 48.5 |
| Inter-orbital breadth | 29.5 |
| Orbital breadth, right | 40.0 |
| Orbital breadth, left | 41.5 |
| Orbital height, right | 30.5 |
| Orbital height, left | 31.0 |
| Mastoid process length, right | 31.0 |
| Maxillo-alveolar length | 60.0 |
| Maxillo-alveolar breadth | 70.0 |
| Palatal length | 50.0 |
| Palatal breadth | 44.5 |
| Palatal depth | 14.0 |
| Occipital foramen length | 32.0 |
| Sagittal cranial arc | 394.0 |
| Transverse cranial arc | 321.0 |
| Horizontal cranial circumference | 550.0 |
| Bi-auricular breadth | 127.0 |
| Outer bi-orbital breadth | 113.0 |
| Inner bi-orbital breadth | 106.0 |
| Greatest occipital breadth | 125.5 |
| Frontal arc | 137.0 |
| Parietal arc | 137.0 |
| Occipital arc | 120.0 |
| Frontal chord | 116.0 |
| Parietal chord | 117.0 |
| Occipital chord | 97.0 |

TABLE 2. *Indices of the skull of skeleton No. SRN-4*

| Cranial index | Value |
|---|---|
| Length-breadth | 76.04 |
| Length-height | 64.58 |
| Length auricular-height | 59.89 |
| Breadth-height | 84.93 |
| Sagittal cranial curvature | 42.38 |
| Transverse cranial curvature | 39.56 |
| Transverse fronto-parietal | 73.29 |
| Superior facial | 43.10 |
| Zygomatico-frontal | 73.79 |
| Inter-orbital | 26.11 |
| Orbital, right | 76.25 |
| Orbital, left | 74.70 |
| Nasal | 53.61 |
| Maxillo-alveolar | 116.67 |
| Palatal | 89.00 |
| Transverse cranio-facial | 99.32 |
| Fronto-parietal | 100.00 |
| Fronto-occipital | 87.59 |
| Parieto-occipital | 87.59 |
| Fronto-sagittal arc | 34.77 |
| Parieto-sagittal arc | 34.77 |
| Occipito-sagittal arc | 30.46 |
| Frontal curvature | 84.67 |
| Parietal curvature | 85.40 |
| Occipital curvature | 80.83 |

of first molars develops in the are-group 40—49 years. In the present case, instead of being fully abraded, one dentinal area in each of the first molars has remained discrete. Although diet certainly abrades cusps, the nature of dentine exposure suggests that the individual could have possibly been around 40 years of age at death.

Sexing was made on the basis of anatomical characters of skull and pelvis only. The masculinity of the skull is strongly reflected by: (I) generally large skull (horizontal circumference 550 mm); (II) marked impressions of muscle attachments, particularly at the nuchal plane; (III) blunt orbital margins; (IV) large and strong mastoids with well-developed supramastoidal crest. The length of right mastoid process is extremely long (31 mm), surpassing the only available mean data for the White (28.07 mm) and the Negro (30.32 mm) male crania (Giles and Elliot, 1963: 57—58).

Masculinity is further attested from the following caracters of pelvis.

(I) The shape of sciatic notch is narrow and deep, confirmed by its angle measurement. The shadow tracing of the notch angle gives a value of 39° and 29° for the left and right bones respectively. The values lie well within the range of this trait for the male, being 26°—65° (but lie far below the range for the female, which is 61°—93°), recorded for the Eskimo pelvis (Hanna and Washburn, 1953: 23); (II) Pre-auricular sulcus is absent; and (III) Estimate of the sub-pubic angle provides a much lower value than 90°. An angle of 90° or over usually suggests female sex (Brothwell, 1963: 55).

From the above examination skeleton No. SRN-4 appears to belong to a male of about 40 years of age.

### *The Skull*

Absolute measurements and indices of the cranium are given in *Tables 1* and *2* and the skull is illustrated in the accompanying *Plate I.*

The skull is large and well-preserved. Vertical contour is broad, and it is more expanded at the parietals. Outer table is smooth with unobliterated sutures. Vault has a flattened keel. The opening of the auditory meatus is oval. Pterion is sphenoparietal. The occipital contour is house shaped, and the occiput is slightly protruding with a moderately developed inion. One wormian bone is present on the left *pars arterica* of the lambdoid suture.

The cranial length is moderately long and the cranial breadth fairly broad. The skull is mesocranial. The vault height is low. In length-height relationship it is chamaecranial, while it is tapeinocranial with regard to breadth-height measurements. This indicates a very low-domed vault. Occipital region is broad. Forehead is receding and broad. Frontal tuberosities are moderately developed. Canine fossa appears to be shallow, while the incisive fossa is slightly developed.

Endocranial capacity is 1449.20 $cm^3$, estimated using Lee-Pearson's (1901: 247) inter-racial formula for the males.

Nasion-prosthion distance is very short in relation to the bizygomatic width which is very broad. This indicates a markedly short and broad face of the hypereuryen type. Orbits are compressed and rectangular in outline. The cavities are set widely apart. Nose heigth is below-medium with a relatively wide nasal breadth, producing a chamaerrhine nasal index. The broad nose is associated with a low-pitched nasal bridge and a somewhat depressed root. Face is slightly prognathous at the alveolar region. The anterior root of zygomatic arch meets or merges with the mesial margin of the first premolars. In consonance with the width of the neurocranium, the splanchnocranium is quite wide. This is reflected from the value of transverse cranio-facial index.

The mid-sagittal craniogram is reproduced in *Fig. 5.*

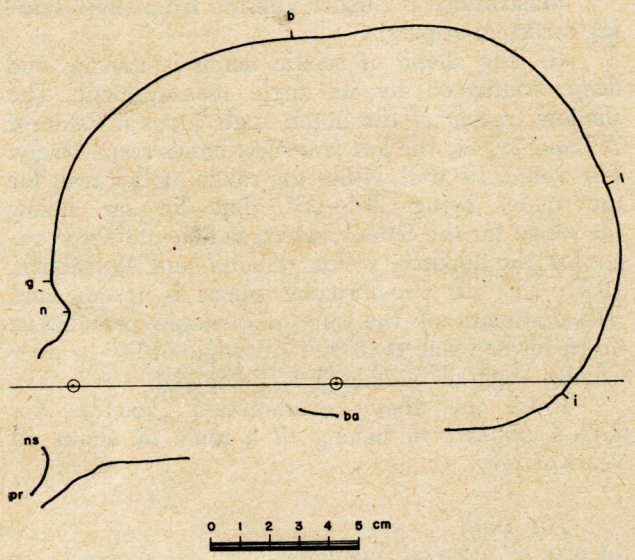


FIGURE 5. *Mid-sagittal craniogram of skull No. SRN-4.*

*The Teeth*

Preservation of maxillary dentition is absolutely good, and the dental arcade is complete with all the eight intact well-set teeth in their sockets of both the sides. Teeth are generally large, and the dentition is devoid of diastema and crowding. The enamel of the dentition is markedly thick. Caries or other periodontal disease is absent, indicating excellent dental health. The third molars have been fully erupted, and their occlusal surface has reached the general level of the dentition. But the left third molar erupted quite later than its counterpart. Shovelling and *tuberculum dentale* on the incisors are absent. Molars are tetracuspid. First molars show well-devedoped hypocone (4), but it is reduced (4-) in second and third molars. The left third molar is not abraded at all, while enamel of the right third molar is slightly abraded. Dentine is barely exposed on the occlusal surface of the incisors, second premolars and second molars and on the cusp-tips of the canines. Attrition links most of the cusps of first premolars and first molars. The nature of abrasion suggests a possible coarse food habit. Attrition of the upper incisors hints a biting habit of an edge-to-edge manner. The thick enamel indicates heavy masticatory ability. Furthermore, the anterior root of zygomatic arch which meets the anterior margin of the first premolars suggests that this maxillo-alveolar architecture is suitable to mobilize heavy pressure for mastication.

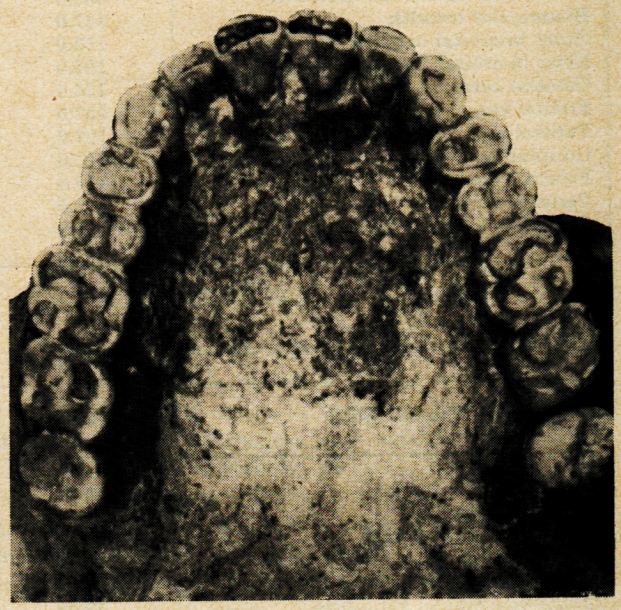

FIGURE 6. *Dentition of the Sarai Nahar Rai Man.*

TABLE 3. *Dimensions (mm) and indices of permanent maxillary dentitions (M-D, mesio-distal; B-L, bucco-lingual; C-H, crown height; C-I, crown index; C-M, crown module; R-V, Robustness value)*

| | $I^1$ | | $I^2$ | | C | | $PM^1$ | | $PM^2$ | | $M^1$ | | $M^2$ | | $M^3$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | L | R | L | R | L | R | L | R | L | R | L | R | L | R | L |
| M-D | 8.7 | 8.5 | 7.0 | 7.0 | 8.0 | 8.0 | 6.5 | 7.0 | 6.6 | 6.6 | 10.0 | 10.2 | 9.5 | 9.2 | 7.9 | 8.0 |
| B-L | 8.5 | 8.2 | 7.0 | 7.0 | 9.3 | 9.2 | 9.6 | 10.0 | 10.0 | 10.1 | 11.1 | 11.2 | 11.5 | 11.5 | 10.2 | 10.4 |
| C-H | 8.3 | 8.3 | 8.0 | 8.1 | 9.5 | 9.3 | 6.8 | 6.0 | 6.1 | 6.1 | 6.6 | 6.6 | 6.0 | 6.0 | 6.0 | 6.0 |
| C-I | 97.7 | 96.5 | 100.0 | 100.0 | 116.2 | 115.0 | 147.7 | 142.8 | 151.5 | 153.0 | 111.0 | 109.8 | 121.0 | 125.0 | 129.1 | 130.0 |
| C-M | 8.6 | 8.5 | 7.0 | 7.0 | 8.6 | 8.6 | 8.0 | 8.5 | 8.3 | 8.3 | 10.5 | 10.7 | 10.5 | 10.3 | 9.0 | 9.2 |
| R-V | 73.95 | 69.70 | 49.00 | 49.00 | 74.40 | 73.60 | 62.40 | 70.00 | 66.00 | 66.66 | 111.00 | 114.24 | 109.25 | 105.80 | 80.58 | 83.20 |

TABLE 4. *Measurements (mm) and indices of clavicle*

| Character/index | Right | Left |
|---|---|---|
| Maximum length | 149.0 | 152.0 |
| Girth at the middle | 40.0 | 40.0 |
| Breadth at sternal end | 25.5 | 24.0 |
| Breadth at acromial end | 26.0 | 26.0 |
| Clavicle-humeral index | 45.43 | — |
| Caliber index | 26.84 | 26.32 |

TABLE 5. *Measurements (mm) and indices of humerus*

| Character/index | Right |
|---|---|
| Maximum length | 328.0 |
| Breadth of proximal epiphysis | 48.0 |
| Breadth of distal epiphysis | 61.5 |
| Longitudinal diameter of the head | 46.5 |
| Transverse diameter of the head | 42.0 |
| Circumference of the shaft at upper-third | 70.0 |
| Least circumference of the shaft | 66.0 |
| Circumference of the head | 135.0 |
| Caliber index | 20.12 |
| Index of the head | 91.30 |

TABLE 6. *Measurements (mm) and indices of ulna*

| Character/index | Right | Left |
|---|---|---|
| Maximum length | 288.0 | — |
| Physiological length | — | 230.0 |
| Least circumference of diaphysis | 38.0 | 40.0 |
| Maximum breadth of the olecranon cap | 25.0 | 27.0 |
| Height of the olecranon cap | 20.5 | 20.0 |
| Thickness of the olecranon cap | 19.0 | 19.0 |
| Caliber index | — | 17.39 |
| Olecranon cap index | — | 8.70 |

TABLE 7. *Measurements (mm) and indices of radius*

| Character/index | Right | Left |
|---|---|---|
| Maximum length | 268.0 | 266.0 |
| Physiological length | 253.0 | 252.0 |
| Least circumference of the distal half | | |
| | (a) 43.0 | (a) 43.0 |
| | (b) 43.0 | (b) 42.0 |
| | (c) 43.0 | (c) 42.0 |
| Sagittal diameter of the shaft | 10.5 | 11.0 |
| Transverse diameter of the shaft | 17.0 | 17.0 |
| Caliber index | 17.00 | 16.67 |
| Diaphyseal index | 61.76 | 64.70 |
| Humero-radial index | 77.13 | — |

Measurements of crown dimensions are given in *Table 3.* Lateral incisors are smaller than the central ones, and the second premolars are smaller than firsts. Third molars are smallest, while first molars are largest. The dentition is classified as mesodont *(Fig. 6).*

*The Post-cranial Bones*

Measurements on the post-cranial bones of the skeleton No. SRN-4 are given in *Tables 4* through *15.*

*Clavicle:* Both are well preserved. Muscular impressions are marked especially on the sternal facet. Deltoid tubercle is not prominent while the coronoid tubercle is moderately developed. Subclavicular groove is shallow with traceable trapezoid line on the ventral surface of the acromial end. Both clavicles are extremely robust, as indicated by the values of the caliber index which are 26.32 and 26.84 for the left and right clavicle respetively *(Table 4).*

*Humerus:* Excepting the region of greater tuberosity, the right humerus is well preserved while the left one is missing. The right humerus has a prominent deltoid tuberosity. The head index of 91.30 shows that the humerus is having a large head. Bicipital groove is deep with well-developed tuberosity. Shaft of the bone is semi-circular in appearance at the middle. The value of caliber index of the bone being 20.12 is high enough to be considered robust *(Table 5).*

*Ulna:* Both are well preserved, except the head portion of the right bone and the styloid process of the left. Supinator ridge and the tuberosity are very prominent with prominent interosseous border, indicating strong musculature. The left ulna is robust, the value of caliber index being 17.39 *(Table 6).*

*Radius:* Both radius bones are intact and well preserved. The interosseous crest of both the bones is prominent indicating strong musculature, and its degree of development could be ascertained from the high diaphyseal index value. But the length of the left bone is shorter than that of the right. Radial tuberosities are aslo highly developed. Cross-section at the level of greatest development of crest is roughly triangular in both. Caliber index for the left and right bone is 16.67 and 17.00 respectively, indicating that the right bone is stouter *(Table 7).*

*Pelvis:* Both the *ossa coxae* are more or less in a good state of preservation, except for some portion of the right ischium which is broken and missing. Muscular impressions are prominent. Greater sciatic notch for both the *coxae* is narrow and deep. The preauricular sulcus is absent. Acetabular cavity of each innominate bone is moderately large. Coxal index, which differs being 59.54 for the left and 62.38 for right bone, shows that the breadth of the left *os coxae* is relatively shorter than that of the right bone. The maximum breadth of ilium, shortest distance between the supraacetabulum point and the anterior edge of the greater sciatic notch, is 62 mm and 61 mm for the left and right side re-

spectively. Obturator foramen of the right *os coxae* is slightly larger than that of the left. Though the sub-pubic angle could not be measured it is evident from a careful estimate that it must be much below 90°. The ischio-pubic index, as described by Schultz (1930: 399), is 71.68 for the right bone, which may be considered as low value. This index is devised to replace the sub-pubic angle *(Table 8).*

TABLE 8. *Measurements (mm) and indices of ossa coxae*

| Character/index | Right | Left |
|---|---|---|
| Breadth of the os coxae | 138.0 | 138.0 |
| Length of the os coxae | 210.0 | 220.0 |
| Vertical diameter of the acetabulum | 57.0 | 57.0 |
| Transverse diameter of the acetabulum | 50.0 | 50.0 |
| Vertical diameter of the obturator foramen | 47.0 | 47.0 |
| Transverse diameter of the obturator foramen | 33.0 | 32.0 |
| Length of the pubic epiphysis | 30.5 | 30.0 |
| Length of the ilium | 123.0 | 124.0 |
| Breadth of the ilium | 131.0 | 131.0 |
| Minimum breadth of the ilium | 61.0 | 62.0 |
| Length of the os pubis | 77.0 | 79.0 |
| Length of the ischium | — | 81.0 |
| Maximum ischiatic diameter | 113.0 | 113.0 |
| Acetabulum index | 87.72 | 87.72 |
| Coxal index | 62.38 | 59.54 |
| Iliac index | 106.50 | 105.64 |
| Pubic index | 58.78 | 60.30 |
| Ischiatic index | 36.82 | 36.82 |
| Obturator foramen index | 70.21 | 68.08 |
| Ischio-pubic index | 71.68 | — |

*Femur:* Both the femora are intact and well preserved. The *linea aspera* is well marked in both, but it is more soin the right bone. In the absolute and physiological length measurements, left femur is shorter than the right one. The head of the bones is moderately large and extremely robust. The distal condyles are moderate in size. The platymeric index, which reflects the shape of the proximal part of femur, shows that the antero-posterior flattening is marked being eurymeric (89.65). It may be stated that platymeria (an index below 84.9) occurs more frequently in modern primitive groups or earlier man, as indicated by Brothwell (1963: 92). The values of caliber index being 20.97 for the left and 20.74 for right femur show that both the bones are extremely robust and stout in build as a whole. The robustness of the bone is also reflected in its head part independently, the robusticity index being 19.66 for the left and 19.54 for the right femoral head *(Table 9).*

The humero-femoral index of 71.61 (for right side) indicates that the upper segment of leg was relatively short in relation to the upper arm.

*Patella:* Both bones are complete and well preserved. They are broad in relation to height, the height-breadth index being 86.96 and 90.91 for the left and right patella respectively. The breadth index suggests that the bones are broad *(Table 10).*

TABLE 9. *Measurements (mm) and indices of femur*

| Character/index | Right | Left |
|---|---|---|
| Absolute length | 464.0 | 462.0 |
| Physiological length | 458.0 | 457.8 |
| Trochanteric length | 432.0 | 432.0 |
| Proximal dorso-ventral diameter | 26.0 | 26.0 |
| Proximal medio-lateral diameter | 29.0 | 29.0 |
| Medial dorso-ventral diameter | 33.0 | 34.0 |
| Medial medio-lateral diameter | 26.0 | 26.0 |
| Circumference of shaft | 95.0 | 96.0 |
| Oblique proximal length | 89.0 | 88.0 |
| Length of head and neck | 65.0 | 66.0 |
| Vertical diameter of head | 45.0 | 45.0 |
| Transverse diameter of head | 44.5 | 45.0 |
| Circumference of head | 142.0 | 142.0 |
| Vertical diameter of neck | 37.0 | 36.0 |
| Transverse diameter of neck | 27.0 | 26.5 |
| Circumference of neck | 113.0 | 114.0 |
| Dorso-ventral diameter of shaft just above the condyles | 31.0 | 30.5 |
| Medio-lateral diameter of shaft just above the condyles | 40.0 | 41.0 |
| Greatest medio-lateral breadth across epicondyles | 78.0 | 79.0 |
| Greatest dorso-ventral length of the lateral condyle | 62.5 | 63.0 |
| Greatest dorso-ventral length of the medial condyle | 63.5 | 64.0 |
| Bi-condylar width | 71.5 | 72.0 |
| Length-circumference index (Caliber index) | 20.74 | 20.97 |
| Length-diameter index (Robusticity index) | 12.88 | 13.11 |
| Platymeric index | 89.65 | 89.65 |
| Pilastric index | 126.92 | 130.77 |
| Popliteal index | 77.50 | 74.39 |
| Head index | 101.12 | 100.00 |
| Robusticity index of head | 19.54 | 19.66 |
| Neck-length index | 141.92 | 144.42 |
| Humero-femoral index | 71.61 | — |
| Epi-condylar breadth index | 17.03 | 17.26 |
| Inter-condylar index | 101.60 | 101.59 |
| Condylar length index | 13.65 | 13.76 |

TABLE 10. *Measurements (mm) and indices of patella*

| Character/index | Right | Left |
|---|---|---|
| Maximum height | 40.0 | 40.0 |
| Maximum breadth | 46.0 | 44.0 |
| Maximum thickness | 21.0 | 20.0 |
| Height index | 46.78 | 46.92 |
| Breadth index | 61.54 | 63.89 |
| Height-breadth index | 90.91 | 86.96 |

*Tibia:* Both bones are complete with well-developed soleal line. Tibial tuberosities are marked with prominent interosseous border. The left tibia is slightly shorter than the right tibia. The medio-lateral flatness at the level of the nutritive foramen is mesocnemic (67.50 for the left and 63.23 for the right bone). The value of caliber index of 20.46 indicates robustness of the bones *(Table 11).*

TABLE 11. *Measurements (mm) and indices of tibia*

| Character/index | Right | Left |
|---|---|---|
| Maximum length (spino-malleolar) | 391.0 | 390.5 |
| Maximum length (condylo-malleolar) | 376.0 | 378.0 |
| Physiological length | 368.0 | 368.0 |
| Dorso-ventral diameter (proximal) | 39.0 | 40.0 |
| Medio-lateral diameter (proximal) | 27.0 | 27.0 |
| Dorso-ventral diameter (medial) | 38.5 | 38.5 |
| Medio-lateral diameter (medial) | 25.0 | 25.0 |
| Dorso-ventral diameter (distal) | 31.0 | 31.0 |
| Medio-lateral diameter (distal) | 23.0 | 23.0 |
| Circumference of the shaft (medial) | 89.0 | 90.0 |
| Least circumference of the shaft | 80.0 | 80.0 |
| Proximal epiphyseal breadth | 74.5 | 78.0 |
| Sagittal diameter of distal epiphysis | 37.0 | 37.0 |
| Platycnemic index | 69.23 | 67.50 |
| Caliber index | 20.46 | 20.49 |
| Tibio-femoral index | 80.52 | 80.35 |

TABLE 12. *Measurements (mm) of fibula*

| Character | Right | Left |
|---|---|---|
| Circumference at the middle of shaft | 48.0 | 48.0 |
| Least circumference | 35.0 | 36.0 |

TABLE 13. *Measurements (mm) and indices of talus*

| Character/index | Right | Left |
|---|---|---|
| Maximum length | 54.0 | 55.0 |
| Maximum breadth | 39.0 | 39.0 |
| Maximum height | 30.0 | 33.0 |
| Breadth of trochlea | 31.0 | 30.0 |
| Length of trochlea | 28.0 | 28.0 |
| Breadth of the head | 19.5 | 20.0 |
| Length of the head | 30.0 | 31.0 |
| Breadth of posterior articular surface | 23.0 | 22.0 |
| Length of posterior articular surface | 33.0 | 33.0 |
| Length-breadth index | 72.22 | 70.91 |
| Length-height index | 55.55 | 60.00 |
| Length-breadth index of trochlea | 51.85 | 50.91 |
| Calcanear articulation index | 69.70 | 66.67 |
| Length-breadth articulation index | 65.00 | 64.52 |

The tibio-femoral index, which compares the length of tibia in relation to femur length, is brachycnemic. This indicates that the individual had a comparatively short tibial length in relation to thigh. Although the tibia is relatively short, it is equally robust compared to femur.

*Fibula:* Both the fibulae are intact, except their proximal ends. Muscular impressions are marked with prominent interosseous border *(Table 12).*

*Talus:* Both are complete. Posterior calcanear articulation is greater for the right than the left, as indicated by the calcanear articulation index value. Length-breadth index is more or less equal for both the bones *(Table 13).*

*Calcaneum:* Right calcaneum is intact but with a slight breakage at the medial articular surface. The left bone is intact, except the tuber calcanei portion which is broken and missing. Breadth of the posterior articular facet is slightly at variance between the bones, while its length measurement is the same for both of them *(Table 14).* This indicates a slightly greater area of the facet for the right calcaneum than its left counterpart.

### *Stature*

The absolute crown-heel diameter of skeleton No. SRN-4, measured *in-situ* within the pit, provided a value of 1650 mm. It lies within the medium class of stature classification. The living stature of the person that has been estimated using the formulae given by Pearson (1889: 169), Dupertuis and Hadden (1951: 15), and Trotter and Gleser (1952: 463; 1958: 79) is furnished in *Table 15.* The estimated values furnish different living stature for the same individual, varying from 1680—1749 mm. The skeletal length measured *in-situ,* which should closely approximate the living stature estimates for the skeleton, is lying far below the range available. The estimate obtained using Pearson's formula gives a minimum difference of +30 mm from the measured body height.

TABLE 14. *Measurements (mm) and indices of calcaneum*

| Character/index | Right | Left |
|---|---|---|
| Maximum length | 79.0 | — |
| Breadth across the substanticulam | — | 44.0 |
| Height of the body | 37.0 | 38.5 |
| Length of the body of the calcaneum | 57.0 | — |
| Height of the tuber | 42.5 | — |
| Breadth of the tuber | 34.0 | — |
| Length of the posterior articular facet of the talus | 28.0 | 29.0 |
| Breadth of the posterior articular facet of the talus | 18.0 | 18.0 |
| Length-height index | 46.83 | — |
| Calcanear-length index | 72.15 | — |
| Tuberal index | 80.57 | — |
| Posterior articular facet index | 64.28 | 62.07 |

TABLE 15. *Estimated stature and its variation from the measured bone-lengths of skeleton No. SRN-4*

| By equation of | Equation in mm | Variation |
|---|---|---|
| Pearson | 1680.406 | +30.406 |
| Dupertuis and Hadden | 1749.033 | +90.033 |
| Trotter and Gleser | 1740.300 | +90.300 |
| Measured skeletal length | 1650.000 | — |

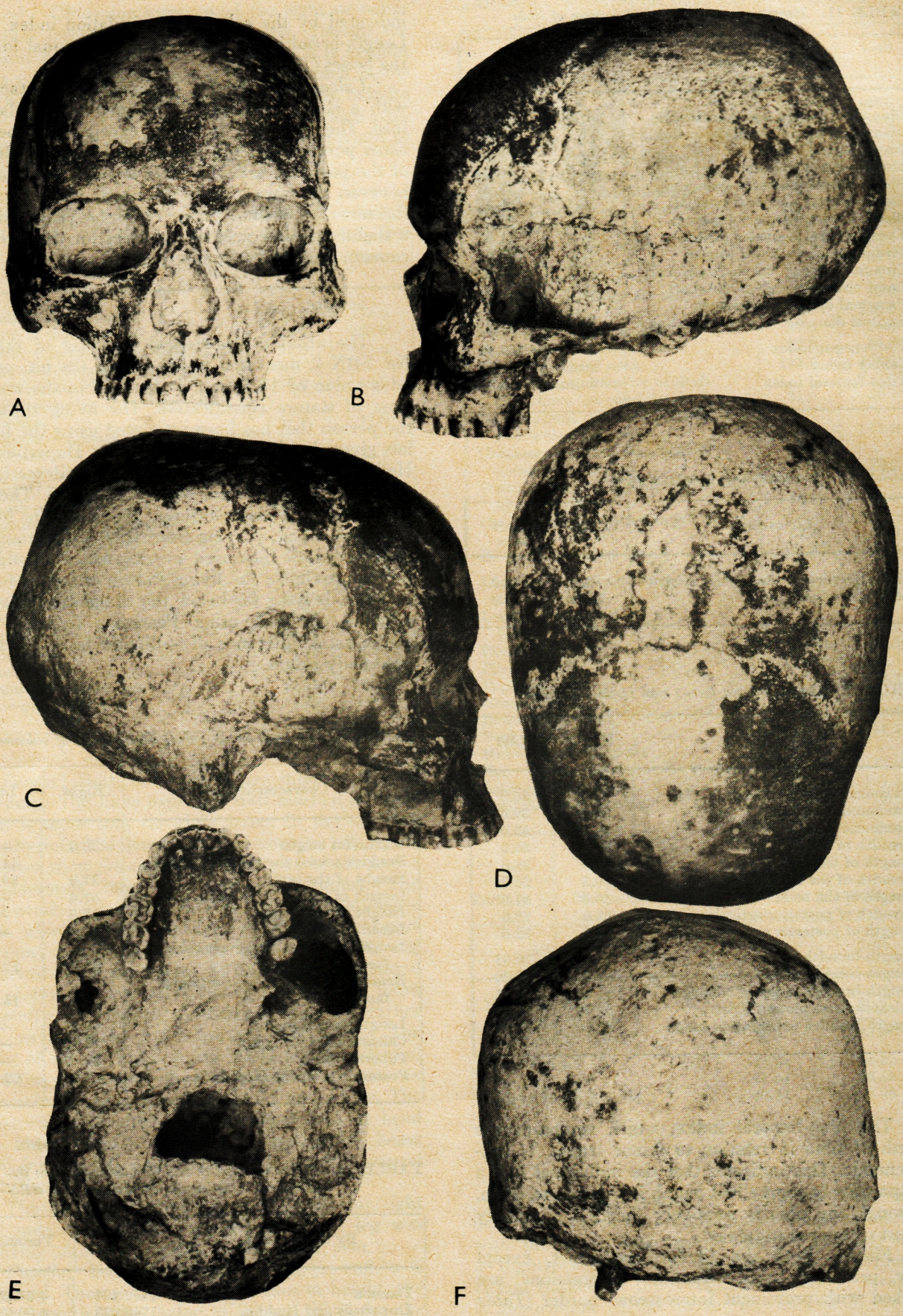


PLATE I. *Sahar Nahar Rai Man skull: a) frontal view, b) lateral view, c) lateral view, d) top view, e) base of skull, f) occipital view.*

## MORPHOLOGY OF SKELETON NO. SRN-5

The material of this skeleton is only represented by the well-preserved and fossilised right clavicle bone. Study shows that the clavicle bone bears well-marked impressions of muscle attachments. Sub-clavicular groove is prominent with marked trapezoid line on the ventral surface of the acromial end. Caliber index of 28.12 indicates that this clavicle is relatively more robust than those of the skeleton No. SRN-4.

## DISPOSAL OF THE DEAD

Evidence from the partially exposed burials at the site as well as from the excavated skeleton No. SRN-4 and SRN-5 shows that the deads were regularly disposed of. Corpses were laid on their back in supine extended position with legs fully stretched. Orientation of the skeletons was in west to east axis, heads placed towards the west.

## ASSOCIATED FINDS

A typical microlithic tool (lunate), two quartz cores and two objects of well-burnt clay (unidentified) were associated with skeleton No. SRN-4. In addition, there were fragmented, fractured, charred or semi-charred animal bones. Besides, one small clay pot was found embedded in the upper part of the filling of the pit. The mouth of the pot could however be seen exposed upon the surface.

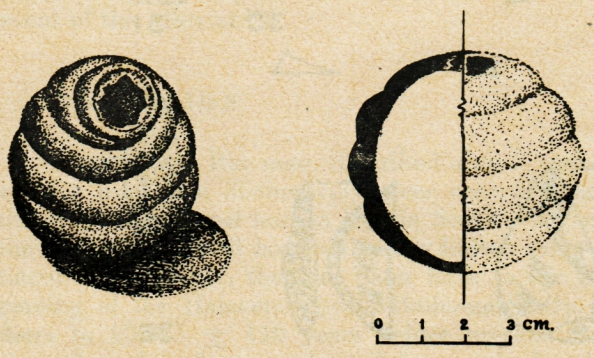


FIGURE 7. *The rude, handmade clay pot.*

The shape of the pot is somewhat round with a flattish-rounded base *(Fig. 7)*. Its mouth has a very small opening. The pot is handmade, prepared by 'coiled' technique and ill-fired. The clay was not well levigated althrough. Outer surface of the pot is very hard and it is incrustrated with lime. The colour of the pot is deep grey. Rude clay pots of this kind were also found present in most of the exposed burials at the site.

Binocular microscopic examination of the pot reveals that fossilised remains of insects represented by the jaw portion and appendages of chitinous composition are present all over the outer surface of the pot. The examination further reveals some impressions which could be either of wing of insents or of sheath of some Gramineae plant like grass.

## BEHAVIOURAL EVIDENCE

The mode of life of prehistoric people may be inferred from the kind of material cultural remains preserved at a given site. At Sarai Nahar Rai, microliths were present upon the surface of the site bearing human burials. The microliths are mostly made on refractory quartz of opalescent variety, with the exception of a very few tools fabricated out of cherty-flint. Heavy tools were almost absent.

Exactly 168 specimens could be identified in the lot of 297 flakes collected as surface find. Five flakes bear signs of use *(Fig. 8, No. 15)*, but these were never prepared intentionally to produce any type form. The quartz industry seems to have predominated by the non-geometric form but the occurrence of geometric form is much conspicuous. Most of the artefacts possess signs of steep and almost vertical retouches.

TABLE 16. *Classification of the Sarai Nahar Rai microliths*

| Type | No. | Per cent |
|---|---|---|
| Blade | 47 | 27.97 |
| Point | 30 | 17.86 |
| Triangle | 20 | 11.90 |
| Trapeze | 7 | 4.17 |
| Lunate | 28 | 16.67 |
| Crescent | 4 | 2.38 |
| Burin | 7 | 4.17 |
| Borer | 3 | 1.78 |
| Piercer | 9 | 5.36 |
| Arrowhead | 8 | 4.76 |
| Utilized flake | 5 | 2.98 |

The typology analysed presents a considerable range of tools *(Table 16)*. It reveals distinctively and predominantly a quartz microlithic industry on flake. The basic elements of this industry noted here are as follows.

(I) Blades: subclassified into obliquely blunted type *(Fig. 8, Nos. 25, 30, 31)*, backed type *(Fig. 8, Nos. 26, 37, 40)*, parallel-sided type *(Fig. 8, Nos. 16, 29, 36, 41)*, shouldered type *(Fig. 8, No. 10)*, blade-cum-borer *(Fig. 8, No. 11)*, and blade-cum-burin *(Fig. 8, No. 27)*.

(II) Points: subclassified into symmetric form *(Fig. 8, Nos. 5, 8, 19, 38)*, asymmetric form *(Fig. 8, Nos. 7, 17)*, single-shouldered type *(Fig. 8, Nos. 14, 24)*, and bifacial points *(Fig. 8, No. 34)*.

(III) Lunates *(Fig. 8, Nos. 2, 12, 33, 35)* and crescents *(Fig. 8, No. 20)*.

(IV) Triangles *(Fig. 8, Nos. 13. 21)* and trapezes *(Fig. 8, Nos. 6, 22)* of typical geometric form.

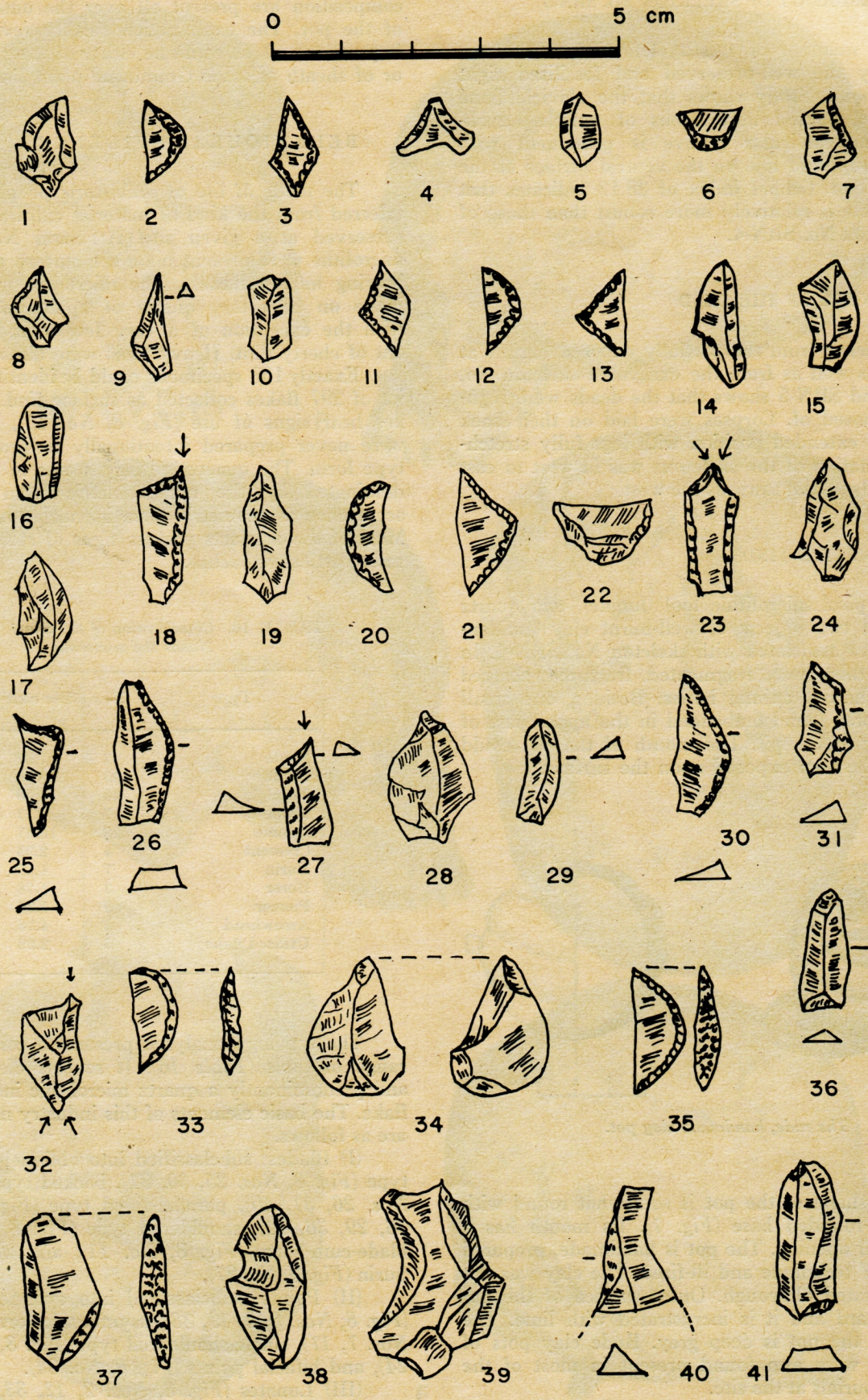


FIGURE 8. *Some of the microlithic tools from Sarai Nahar Rai site.*

In addition to these basic types, there are piercers *(Fig. 8, No. 9)*, burins, borers *(Fig. 8, No. 28)*, and arrowheads *(Fig. 8, Nos. 1, 4)*. Although the blades are represented more, they are shorter in size and display crudity of technique in their manufacture. Burins, miniature in form, exhibit traces of burin-facets, while some of the piercers may just be accidental but attesting their use. Lunates and trapezes are very much typical in form. The arrowheads are small, characterised by a broad point opposite to the base which is somewhat concave.

The microliths, collected as surface finds, represent a behavioural form or cultural stage conducive to a mode of life based on hunting, fishing and gathering.

## DATING

Radiometric (C-14) analysis of human bone sample from skeleton No. SRN-5 (Trench C-5, qd. 3, layer 1, depth 5 cm) labelled Index No. TF-1104, belonging to the same deposit as of skeleton No. SRN-4, gives a date of 10,345 $\pm$ 110 years B. P. (or 8395 B. C.). The date is based on the radiocarbon half-life value of 5730 $\pm$ 40 years. The same sample, TF-1104, again gives a date of 10,060 $\pm$ 110 years B. P. on the basis of the half-life value of radiocarbon 5568 $\pm$ 30 years (Agrawal and Kusumgar, 1971; cf. *Indian Archaeology — A Review 1970—1971, p. 73).*

It is important to note that the pedocalic hozizon, in which the skeletons were found *in-situ,* was developed during the beginning of the Holocene epoch. Thus the radiomeric date available for the skeleton shows a good correspondence with the event of this alluvial fill.

## DISCUSSION

Sarai Nahar Rai man, described above, makes out for himself a distinctively clear case of being the only oldest fossil human find in South Asia and the only oldest fossil hominid in the Indian subcontinent. Geologically, the find dates back to the beginning of the Holocene epoch. Radiometrically, it dates to 10,345 $\pm$ 110 years before present. But since it is based on uncharred bone sample, the estimated date may not be highly accurate.

The Sarai Nahar Rai man was an adult of about 40 years of age. He had generally a large head (length 192 mm, breadth 146 mm; index 76.04 — mesocranial; horizontal circumference 550 mm), short and broad face (nasion prosthion line 62.5 mm, bizygomatic breadth 145 mm; superiorfacial index 43.10 — hypereuryne) with large healthy teeth and robust physique having a medium bodyheight (absolute crown-heel length 1650 mm; living stature estimated at 1680.406 mm after Pearson).

The morpho-anatomical characters of the individual lie within the normal range of variation for modern man. But two characters of the skull certainly call for special attention in the context of human palaeontology. The first one is the architecture of the maxillo-alveolar region. It is designed to meet the anterior root of *arcus zygomaticus* with the mesial margin of the first premolars. This kind of structural composition is most effective for mobilizing heavy pressure at mastication of food. In modern man, the meeting of the root of zygomatic arch usually takes place between the distal margin of second premolars and the mesial margin of the first molars. The second one is the markedly thick coating of enamel on the generally large teeth, confirming heavy masticatory ability of the individual. The nature of dentine exposure suggests a possible coarse food habit.

It may be noted here that subsequently eleven more human burials were excaveted from the site by Dr. Anadi Pal of the Anthropological Surey of India in 1973. Of them, five male and five female skeletons were identified. It is unfortunate that this most important collection, which is in the custody of the Ancient History and Culture Department of the Allahabad University, has not ye been studied. A thorough study of this skeletal series is of eminent importance in understanding human variation and skeletal biology of the earliest population that thrived at Sarai Nahar Rai during the beginning of the Holocene epoch.

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