



## FIRST RECORD OF A MIDDLE PALAEOOLITHIC FOSSIL FROM GUJARAT, INDIA

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### ABSTRACT

A third metacarpal (cannon bone) of *Equus cf. E. asinus* Linnaeus, 1762 obtained recently by Dr. H. D. Sankalia from the cemented gravel on the left bank of the Meshvo river in Gujarat, forms the first record of a Middle Palaeolithic fossil from Gujarat. Middle Palaeolithic tools like points and scrapers were also found along with the fossil. A detailed morphological account of the find has been given and its significance in evolutionary tendencies of the equids discussed. The study lends support that the proportional length of the third metacarpal is important for identification of different species of equids. It is suggested that the asses appear in India only in the Late Pleistocene. The slender limbs of the asses are not indicative of great speed and the hoofs of these animals are adapted to a rocky ground. Notes on the Quaternary equids of India have also been given.

### INTRODUCTION

The specimen under discussion was collected by Prof. H. D. Sankalia in course of his prehistoric explorations around the Meshvo (Meshwa) river in Gujarat and very kindly passed on to the author for study. The fossil (a cannon bone of *Equus cf. E. asinus*) was discovered from the eroded portion of the cemented gravel about 4.2 metres from the base of the trap rock on the left bank of the Meshvo, at the foot of the village Tajpur ( $23^{\circ} 22' 02''$  :  $73^{\circ} 04' 05''$ ), now called Tejpur, about 2.3 km northeast of Harsol (Fig. 1). This locality falls

in the mid-western portion of the Survey of India topographic sheet No. 46  $\frac{E}{3 \text{ \& } 7}$ , scale 1" = 1 mile (old number 147). The bank at this place is about 6 to 9.5 metres in height. The gravel varying in thickness from 1 to 3 metres rests on the hard trap rock of about 1.5 metres thickness being covered by 3 to 3.6 metres thick calcareous silt which is in turn covered by modern sandy silt of 0.5 to 1.25 metres thickness (Fig. 2). In the same gravel were found a few Middle Palaeolithic tools like points and scrapers and huge chunks of agate. The Meshvo river originates on the southern slopes of the Aravallis and flows for a distance of about 150 km. in southwesterly direction to meet the Sabarmati which debouches in the Gulf of Cambay.

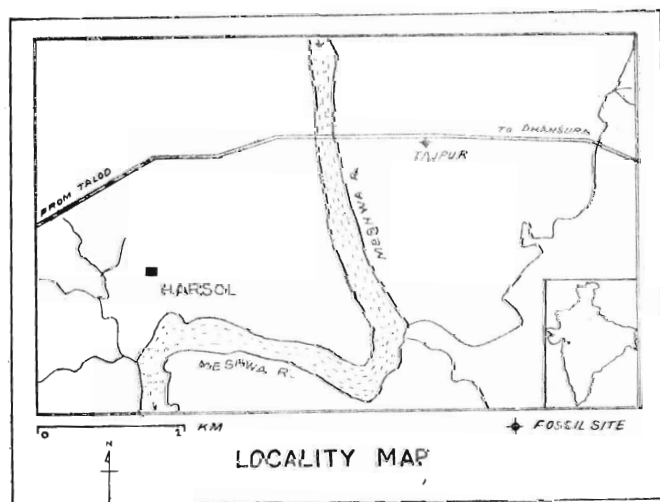


Fig. 1. Locality map

### SYSTEMATIC PALAEOLOGY

- Class Mammalia Linnaeus, 1758  
 Order Perissodactyla Owen, 1847  
 Family Equidae Gray, 1821  
 Sub-family Equinae Steinmann and Döderlein, 1890  
 Genus *Equus* Linnaeus, 1758

### GENERIC DIAGNOSIS :

Head elongate, crest of long hairs along the back of the neck, long hairs on the tail ; cheek teeth hypsodont with flat rectangular crowns, with extremely complicated folds of enamel, canines generally wanting in the

GENERALISED SECTION OF THE LEFT BANK OF  
MESHWA RIVER ( GUJARAT )  
( WHERE FROM FOSSIL WAS COLLECTED )

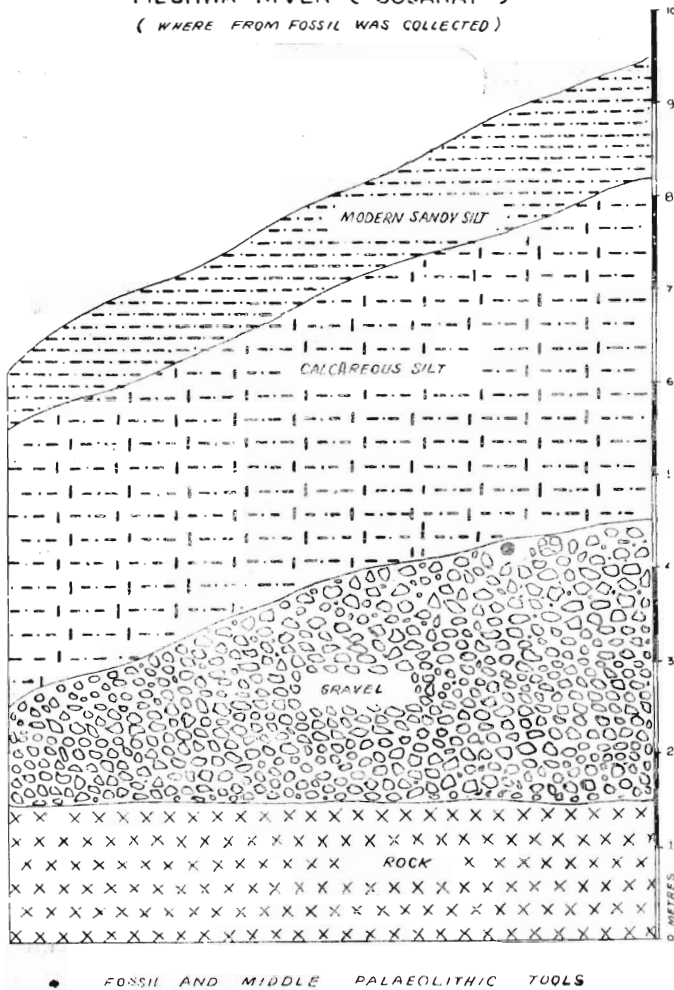


Fig. 2. Generalized section of the left bank of Meshwa river (Gujarat).

females, incisors with a flat crown, with at first a deep hollow in the middle ; a peculiar callosity inside each forearm and tarsus, ulna and fibula rudimentary and incomplete distally ; feet normally monodactyl. (Zittel, 1925 ; Simpson, 1951 ; Romer, 1964).

*Equus cf. E. asinus* Linnaeus, 1762.

*Equus asinus* Linnaeus, 1762; *Regn. Anim.*, : 70, 72

*Equus asinus*, Linnaeus, 1824; *Zool. Jour.*, 1 : 244

*Equus asinus*, Lydekker, 1886; *Rec. Geol. Surv. India*, 19(2): 120-122

*Nature of present collection* : A third metacarpal (MC III, cannon bone) of *Equus cf. E. asinus* Linnaeus, 1762.

*Specific diagnosis* : Skull deep, relatively short and broad, rostrum narrow, brain case larger than the face, upper profile of the skull wavy with distinct concavity at the middle of the nose, postorbital bars laterally prominent, zygomatic arches converge rapidly backwards, choanae narrow, palate short, supraoccipital crest strongly

developed ;teeth relatively smaller than in other horses ; limbs slender, hoofs narrow. (Azzaroli, 1966).

*Description* : The specimen (Plates 1-3, fig. 3) is a long, slender, third metacarpal (cannon bone) of *Equus cf. E. asinus*. It measures about 210 mm in length and 47 mm in breadth both at the proximal and distal ends. The minimum breadth of the shaft is about 31 mm at about 2/3 distance from the proximal end. While the antero-posterior diameter at both the ends is about 47 mm, the transverse diameter at the proximal end is about 32 mm, and at the distal end about 35 mm. The remnants of the 2nd and 4th metacarpal are not fused with the cannon bone. The complete fusion of the distal epiphysis of the metacarpal indicates that the animal to which this bone belonged was more than 1-1/2 years old (Cornwall, 1956).

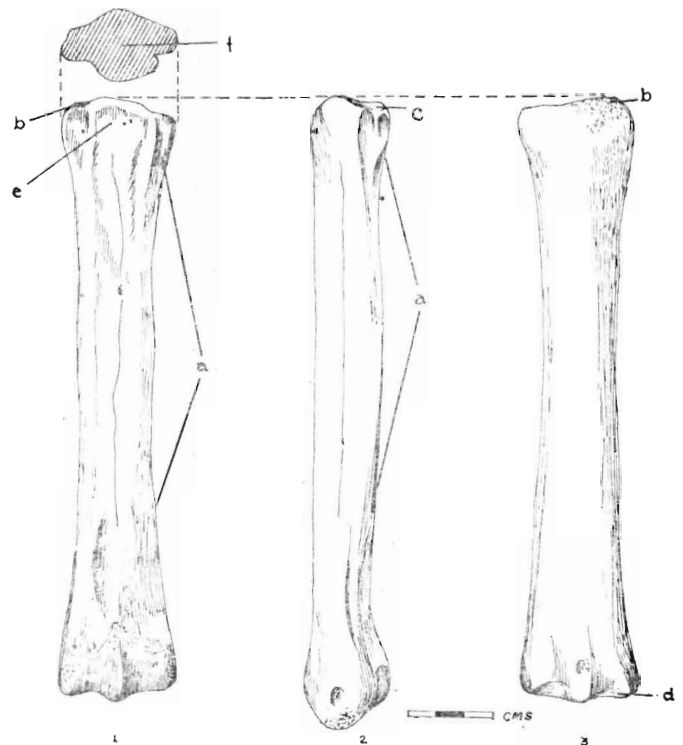


Fig. 3 (1) Proximal and ventral view  
(2) Lateral view  
(3) Dorsal view

Abbreviations used in Fig. 3

- a. Scar for attachment of the interosseous metacarpal ligaments
- b. Facet for articulation with the hamatum
- c. Facets for articulation with MC IV
- d. Articulation surface with the first phalange
- e. Attachment for the interosseous muscle
- f. Facet for articulation with the magnum

The proximal end of the metacarpal is D- shaped and its articulation consists of a number of almost flat facets. The volar tubercle for the attachment of the interosseous muscle is more ridge shaped as against some tridactyl horses where this is in the form of a tuberosity.

The facet for articulation with the magnum on the posterior part is straight in antero-posterior direction. There is a facet on the posterior medial side for articulation with the trapezoideum (since more weight is borne by the third digit) whereas this facet is lacking in all tridactyl horses.

The shaft of the metacarpal is roughened along both sides for the attachment area of ligaments for the lateral metapodials (the interosseous metacarpal ligaments). The rough area which lies more on the volar side, reaches up to less than 2/3 of the metacarpal whereas in tridactyl horses this can be followed up to the distal articulation surface of the bone. The diameter of the metacarpal is more semi-cylindrical and flattened on the volar side. The scar for the attachment of the superficial layer at the collateral ligaments is not prominent in the present specimen.

The distal articulation surface for the first phalanx and proximal sesamoid bones is composed of two condyles, which are separated by a sagittal crest, developed clearly both on the anterior and posterior side of the metacarpal. According to Gromova (1952), the development of the sagittal crest runs parallel in the first place to the lengthening of the central phalanges and secondly the reduction of the laterals in the phylogeny of the *Equus* and prevents the fetlock joint from too much lateral dislocation. The rounding of the pulley-like articulation joint, which is an important factor in the phylogeny of the equids, is more than half a circle in the present specimen. The distal articulation surface is more pulley-like around the shaft which gives the proximal phalanx the maximum flexibility in dorsal direction.

**Remarks :** A number of important changes take place in the third metacarpal of *Equus* (the genus embracing horse, ass and zebra) for instance in the shape of the bone, facets and area of attachment for ligaments and tendons, which can best be explained by the change in the locomotion apparatus. The proportional length of the third metacarpal is significant for identification of different species of *Equus* (Sondaar, 1968).

The conception that, in the phylogeny of *Equus*, there should be a relative lengthening of the central metapodial in relation to other bones (femur-tibia, radius-humerus) is not generally true. Statistical studies carried out by Sondaar (1968) on metacarpal data of some fossil and recent equids shows that there is some variation in proportional length of the third metacarpal. Though in some slenderly built pre-*Equus* genera, the metacarpal is generally longer, no striking difference between some pre-*Equus* and *Equus* species have been observed. The antero-posterior diameter of the third metacarpal is proportionally bigger in the primitive forms and during the evolution of equids, the width at the proximal part of the third metacarpal tends to increase in relation to diameter.

In the genus *Equus* there is utmost extremity in reduction of the forelimbs and manus (Cornwall, 1956) though there is extreme specialization for speed in its feet. Foot type is very effective in an open country on firm soil and gives the animal great power of endurance. However, the limbs of asses are slender—a feature that does not correspond to a particularly great speed. The hoofs are narrow and seem to be adapted to a rocky ground (Azzaroli, 1966).

#### EQUIDS FROM THE QUATERNARY DEPOSITS OF INDIA :

In the monograph on the fossil and living horses of India, which is presently under preparation, the author has detailed all the various forms with critical notes on their classification, evolution and distribution. However, a marginal reference to these forms is not out of place here. Seven species belonging to the genus *Equus* are reported from the Quaternary of India. These are : *Equus sivalensis* Falconer and Cautley, 1849 ; *Equus cautleyi* Hopwood, 1936 ; *Equus namadicus* Falconer and Cautley, 1849 ; *Equus palaeonius* Falconer and Cautley, 1849 ; *Equus caballus* Linnaeus, 1758 ; *Equus asinus* Linnaeus, 1762 and *Equus hemionus* Pallas, 1775.

*Equus sivalensis* is reported from the Lower Karewas of Kashmir and Pinjor Formation (Upper Siwaliks) of the Punjab and Himaceal Pradesh (both Basal—Lower Pleistocene). The presence of *Equus* is a positive evidence for the Pleistocene age of the deposits and it is an ideal index fossil to aid in correlation of deposits of this age.

*Equus cautleyi* was based on two mandibular ramii, one figured by Falconer and Cautley (1849 ; pl. 82, fig. 2, regd. no. 23107 B.M.N.H.) and the other by Colbert (1935 ; fig. 71, regd. no. 19884 A.M.N.H.) on the basis of their larger size. Both these ramii were previously referred to as those of *Equus sivalensis*. After a detailed morphological and statistical study, Badam (1973) and Tewari and Badam (in press) have shown that *Equus cautleyi* lies within the limit of species variation of *Equus sivalensis* and that there are no grounds to maintain the species only on the basis of larger size and especially without any morphological differences. The larger size of *Equus cautleyi* is therefore attributed to the difference in age or sex of the individual or/and the effect of environment.

*Equus namadicus* is reported from the Narmada Alluvial deposits of Central India, Godavari basin (Maharashtra), Ariyalur (Tamil Nadu) and Susunia (W. Bengal) (Middle—Late Pleistocene). This species has evoked lot of controversy among specialists with regard to its validity. Lydekker (1882) maintained that this is a separate species having more specialized characters as compared to those of *Equus sivalensis*, though he regards *Equus namadicus* as a survival from the Siwaliks (Lydekker, 1883). Matthew (1929) suggested that *Equus namadicus*, on the basis of its

younger geological age, may be a progressive form of *Equus sivalensis*—an opinion also endorsed by Colbert (1935) and Hooijer (1949). Azzaroli (1966), however, treated the two species as separate, on the basis of larger and broader skull of *Equus namadicus* though he did not rule out the possibility of its being a relative of *Equus sivalensis*. More recently, Badam (1973) and Badam and Tewari (1974), on the basis of extensive morphological and statistical studies carried out on the cranial remains and dentition of both the species (housed in the Museum of the Centre of Advanced Study in Geology, Panjab University, Chandigarh; Palaeontology Section, Indian Museum, Calcutta and Deccan College Post-graduate and Research Institute, Poona) also suggested that *Equus namadicus* can reasonably be treated as a synonym of *Equus sivalensis*.

*Equus palaeonus* also collected from the Pleistocene beds of the Narmada Alluvial deposits, was proved to be only a young of *Equus sivalensis* or *Equus namadicus* (Falconer, 1868) and subsequently regarded synonymous with *Equus namadicus* (Lydekker, 1882).

*Equus asinus* has been reported by Lydekker (1886) and Murty (1974) from the Kurnool caves of Andhra Pradesh (Late Pleistocene) associated with cultural material ascribed to a phase of Indian Upper Palaeolithic. From the Chalcolithic phase of India, this species is reported from <sup>1</sup>Navdatoli, M. P. (Shah, 1971) dated 1700 B.C.—1450 B.C., <sup>1</sup>Ahar, Rajasthan (Shah, 1969) dated 2150 B.C.—1300 B.C., Rangpur, Gujarat (Nath 1968) dated 2000 B.C.—800 B.C., Rupar, Punjab (Nath, 1968) dated 2000 B.C.—900 B.C. and Maski, Mysore (Nath, 1957) dated 1000 B.C.—100 A.D. From the Neolithic phase, this species is reported from <sup>1</sup>Kodekal, Mysore (Shah, 1973) dated 2500 B.C. From the Iron Age, *E. asinus* comes from Ujjain, M.P. (Nath, 1968) dated 750 B.C.—1400 A.D., Nagarjunakonda, A.P. (Nath, 1968) dated 200 A.D.—1200 A.D. and Jaugada, Orissa (Nath, 1968) dated 400 B.C.—200 A.D. It may be added here that the remains of the domestic ass (*E. asinus*) are found in the late period of Harappan Culture of Rupar. The remains of a sacrificed pony from the *aswamedh* site of Nagarjunakonda is of special significance as it throws light on the ritual and cultural practices of the descendants of the Ikshuvaku kings who ruled there at that time (Nath, 1968).

*Equus caballus* is reported from the Chalcolithic phase at <sup>1</sup>Kayatha, M.P. (Alur, 1975) dated 2000 B.C.—1400 B.C., <sup>1</sup>Inamgaon, Maharashtra (Badam, 1977) dated 1500 B.C.—1000 B.C., <sup>1</sup>Lothal, Gujarat (Nath, 1968) dated 2100 B.C.—1600 B.C. and Rupar, Punjab (Nath, 1968) dated 2000 B.C.—900 B.C. From the

Neolithic phase, this species is reported from <sup>1</sup>Hallur, Mysore (Alur, 1971) dated 1700 B.C.—1000 B.C. From the Iron Age, the horse is reported from Nevasa, Maharashtra (Eapen, 1960) dated 50 B.C.—200 A.D., Ujjain, M.P. (Nath, 1968), dated 750 B.C.—1400 A.D., Nagarjunakonda, A. P. (Nath, 1968) dated 200 A.D.—1200 A.D. and Hastinapur, U.P. (Nath, 1968) dated 1100 B.C.—300 A.D. Presence of the horse in the late period of Harappan Culture at Rupar and Lothal is noteworthy. Its presence during the painted greyware period of Hastinapur is significant, as this animal played an important part in the everyday life of the people.

*Equus hemionus* (Asiatic wild ass) is reported from the Neolithic of Brahmagiri, Mysore (Nath, 1968) dated 1000 B.C.—200 A.D. Nath (1968) opines that this find has resemblance with *E. hemionus kiang* but this subspecies is unknown in the western and southern India. It may be mentioned in passing here that at present two varieties of wild ass are present in India, viz., *E. hemionus kiang* Moorcroft, 1841 (Tibetan wild ass) in the north and *E. hemionus khur* Lesson, 1827 (Indian wild ass) in the west in deserts of the Rann of Kutch. Azzaroli (1966) suggested that this name should be replaced by *E. onager khur* Lesson, 1827 but the name *E. hemionus khur* continues to be in usage. *E. hemionus kiang* is not supposed to be domesticated while *E. hemionus khur* is readily tamed when young but cannot ordinarily be trained to harness when grown up (Prater, 1965).

The problem of domestication of these horses is outside the scope of the present paper. According to Nobis (1960) the horse was domesticated around 3000 B.C. in southern Russia. The domestic ass was first domesticated in Egypt some 2000 B.C. (Boessneck, 1953) from where it was distributed to Mesopotamia. According to Wheeler (1968) there existed an intensive trade between the Indus Valley Culture and the Near East and it is therefore possible that the domestic ass could already have been known in the Indus Valley Culture. From there it would have been dispersed to India (Clason, 1977).

The equid remains found from the Mesolithic phase of Tilwara, Rajasthan (No date available) (Thomas, 1975) and the Chalcolithic phase of Surkotda<sup>2</sup>, Gujarat (2100 B.C.—1700 B.C.) (J. P. Joshi: personal communication) have not as yet been specifically identified.

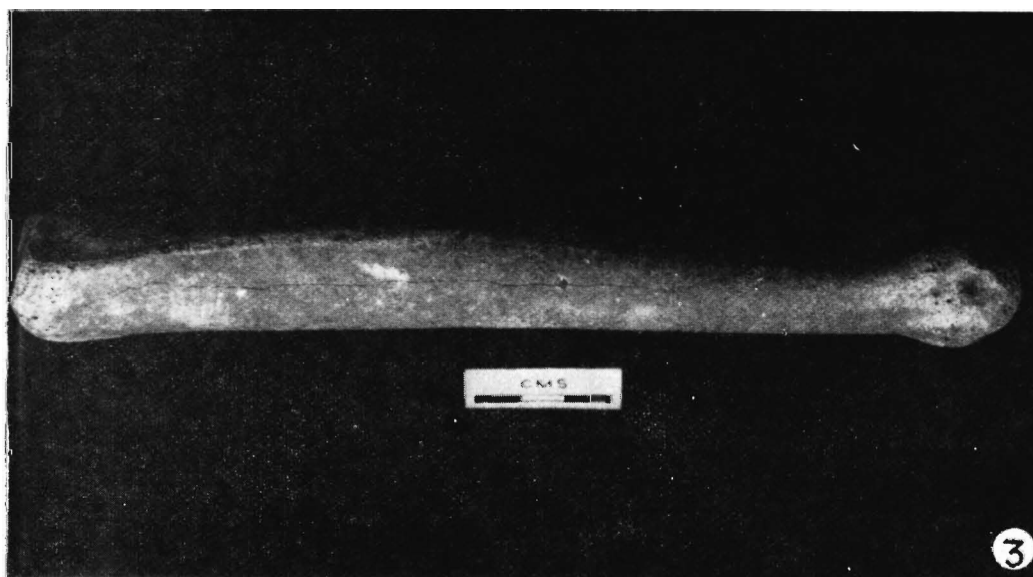
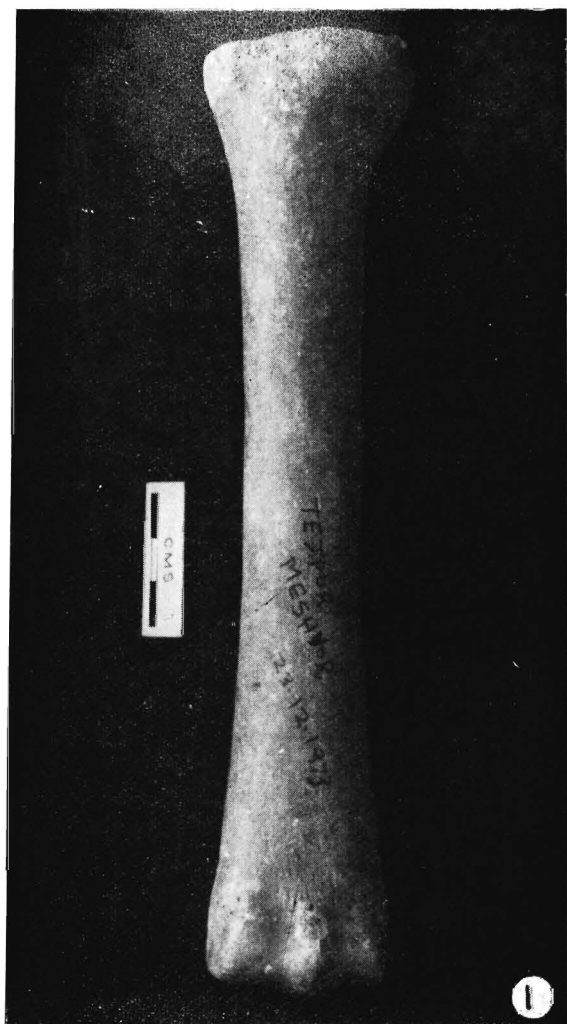
From the foregoing account it can be seen that a number of equid species have been described from the Quaternary of India and most of these are well established. The present study suggests that the asses are absolutely unknown in Mid. Pleistocene and that they appear in India only in the Late Pleistocene and make their first

1. Dates mentioned are based on radiocarbon and half life of radiocarbon used in arriving at these dates is  $5730 \pm 40$  years. The other dates are archaeological estimates.

2. The equids remains from Surkotda have now been identified as *Equus caballus*, *Equus asinus* and *Equus hemionus*.

DISTRIBUTION OF EQUUS SSP. IN INDIAN QUATERNARY DEPOSITS

AGE	CULTURE	LOCALITY	SPECIES	REMARKS
QUATERNARY	IRON AGE	JALGAON (GUJARAT)	<u>E. ASINUS</u>	DOMESTIC HORSE AND ASS
		HASTINAPUR (M.P.)	<u>E. CABALLUS</u>	
		NAGARJUNAKONDA (A.P.) UJJAIN (M.P.) NEVADA (MAHARASHTRA)	<u>E. CABALLUS</u> , <u>E. ASINUS</u> <u>E. CABALLUS</u> , <u>E. ASINUS</u> <u>E. CABALLUS</u>	
	NEOLITHIC	MALLUR (KARNATAK)	<u>E. CABALLUS</u>	THE ASIATIC WILD ASS AT BRAHMAGIRI MAY BE <u>E. HEMIONUS KHUR</u> .
		BRAHMAGIRI (KARNATAK) TODKAL (KARNATAK)	<u>E. HEMIONUS</u> <u>E. ASINUS</u>	
	CHALCOLITHIC	MASKI (MADHARATK)	<u>E. ASINUS</u>	DOMESTIC HORSE AND ASS. THE EQUUS OF SURKOTDA HAS NOT BEEN SPECIFICALLY IDENTIFIED.
		RUPAR (GUJARAT)	<u>E. CABALLUS</u> , <u>E. ASINUS</u>	
		RANGPUR (GUJARAT)	<u>E. ASINUS</u>	
		SURKOTDA (GUJARAT)	<u>EQUUS SP</u>	
		LOTHAL (GUJARAT)	<u>E. CABALLUS</u>	
MESOLITHIC (L.S.A.)	ANAR (RAJASTHAN)	<u>E. ASINUS</u>	<u>EQUUS SP</u>	
	INAMGAON (MAHARASHTRA) NAVDATOLI (M.P.) KAYATHA (M.P.)	<u>E. CABALLUS</u> <u>E. ASINUS</u> <u>E. CABALLUS</u>		
PLEISTOCENE	UPPER PALAEO-LITHIC	TILWARA (RAJASTHAN)	<u>EQUUS SP</u>	<u>EQUUS SP</u> WAS FOUND FROM UPPER LEVELS. NO DATE IS AVAILABLE. <u>EQUUS SP</u> HAS RESEMBLANCE WITH THOSE OF GHOD VALLEY
		KURNOOL (A.P.)	<u>E. ASINUS</u> , <u>EQUUS SP</u>	
	MIDDLE PALAEO-LITHIC (M.S.A.)	GHOD VALLEY NEAR INAMGAON (MAHARASHTRA)	<u>EQUUS SP</u>	<u>E. PALAEOEQUUS</u> IS A SYNONYM OF <u>E. NAMADICUS</u> .
		NEVASA (MAHARASHTRA)	<u>EQUUS SP</u>	
		MULA VALLEY NEAR NUPITI (MAHARASHTRA)	<u>EQUUS SP</u>	
		SUSUNIA (W. BENGAL) NARMADA (M.P.) MESHWA (GUJARAT)	<u>E. NAMADICUS</u> , <u>E. PALAEOEQUUS</u> <u>E. NAMADICUS</u> , <u>E. PALAEOEQUUS</u> <u>E. OF ASINUS</u>	
	LOWER PALAEO-LITHIC (E.S.A.)	NARMADA (M.P.)	<u>E. NAMADICUS</u> , <u>E. PALAEOEQUUS</u>	<u>EQUUS SP</u> WAS FOUND OPPOSITE HATHWELL SECTION ON RIVER PRAPRA NEAR NEVASA ALONG WITH ESA AND MSA TOOLS. AGE TOOLS HAVE BEEN FOUND HERE.
		GODAVARI (MAHARASHTRA)	<u>E. NAMADICUS</u>	
		NEVASA (MAHARASHTRA)	<u>EQUUS SP</u>	
		ARVALUR (TAMILNADU)	<u>E. NAMADICUS</u>	
EARLY BASAL	NO TOOLS	KAREWAS (KASHMIR)	<u>E. SIVALENSIS</u> , <u>EQUUS SP</u>	NO STONE AGE TOOLS <u>E. CAULLEYI</u> IS NOW CONSIDERED SYNONYMOUS WITH <u>E. SIVALENSIS</u> .
	NO TOOLS	SIWALIKS (PUNJAB)	<u>E. SIVALENSIS</u> , <u>E. CAULLEYI</u>	
EARLY BASAL	NO TOOLS	KAREWAS (KASHMIR)	<u>E. SIVALENSIS</u> , <u>EQUUS SP</u>	NO STONE AGE TOOLS EXCELLENT EVIDENCE OF P-LIC-PLEISTOCENE TRANSITION
	NO TOOLS	SIWALIKS (PUNJAB)	<u>E. SIVALENSIS</u> , <u>E. CAULLEYI</u>	



BADAM

appearance in Europe also in Late Pleistocene (Azzaroli 1966).

The occurrence of *Equus* ssp. from the Quaternary of India is given in Table 1.

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#### EXPLANATION OF PLATE

##### PLATE I

1. Dorsal view of the metacarpal
2. Ventral view of the metacarpal
3. Lateral view of the metacarpal