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A PRELIMINARY NOTE ON THE QUATERNARY GEOLOGY AND MIDDLE – LATE PLEISTOCENE FAUNA COLLECTED FROM VARIOUS TRIBUTARIES OF THE BHIMA VALLEY, MAHARASHTRA

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ABSTRACT

During the last three decades or so, the Bhima valley in Maharashtra has received a lot of attention in Quaternary studies encompassing the areas of geology, geoarchaeology, palaeontology and related aspects. Though the work in the upper reaches of the valley is well known at and around Inamgaon on the Ghod, at Morgaon, Bori, and other sites, the present work represents the first detailed study in the lesser known middle reaches of the Bhima which has brought to light a lot of data of the faunal and cultural material in addition to geological and geomorphological data of the valley. The faunal and cultural material has confirmed the presence of Man during the Palaeolithic and Mesolithic times in the area.

The Bor, Man, Sina, Bori and several river basins and tributaries have been thoroughly explored/ excavated during the last ten years or so**.** At several places in the Bhima valley, evidences of the Mesolithic, Chalcolithic, Early Historic and Medieval period have been found. From the Mesolithic period, cultural material such as blades, flakes, cores, scrapers, points, borers, etc. made on chalcedony, agate and chert are reported, whereas fossils include those of *Bos* sp., *Bos namadicus, Equus* sp., etc. which have been studied from taphonomic point of view. A general account of the faunal distribution pattern and palaeoecologic interpretation has also been included.

Keywords: Quaternary, cultural material, faunal material, taphonomy, palaeoenvironment.

INTRODUCTION

The Bhima valley, in parts of Maharashtra, has received a lot of attention in Quaternary studies from a multidisciplinary point of view during the last three decades or so. After the initial work in the upper reaches of the Bhima valley at Inamgaon on the Ghod, Morgaon, Bori, and other sites the present work represents the first detailed study in the middle reaches of the Bhima which has brought to light a lot of data of the faunal and cultural material, geological and geomorphological history and other aspects of the Quaternary studies. The faunal and cultural material has confirmed the presence of Man during the Palaeolithic and Mesolithic times in the area (Kajale *et al.,* 1976; Mishra, 1998 and references therein, Kale *et al.,* 1993).

GEOLOGY AND RELATED ASPECTS

The Bhima district as a whole is covered by Deccan Trap basaltic lava flows, which, in turn, are covered almost everywhere by a thin mantle of soil. These flows, on account of differential weathering, have given rise to undulating relief. The fine grained dark grey basaltic flows cover the high country while the weathered vesicular and zeolitic basalts generally cover the valleys in the area.

The geological sequence in the district is as follows:-

Alluvium and soil with horizons of calcareous *kankar* locally.	Recent.
Basalt flows belonging to the Deccan Trap volcanic episode.	Cretaceous-Eocene.

Locally, the stream banks and immediate sides have comparatively, fine textured, loamy, agriculturally more productive soils. Water-supply is more easily available along the streams, at least in shallow surface depths, as is well reflected from the lining of the *babul* and *khair* trees on river-banks in an otherwise bleak and treeless landscape.

The main river of the district is the Bhima, with its right-bank feeders, the Nira and the Man and its left-bank feeders, the Sina and the Bori. Besides, a good number of lesser streams from the tributaries of the Bhima serve as its local feeders. The Bhima and the Sina flow with a roughly south-easterly trend while the Nira runs east and the Man north-easterly. During the summer season, all these rivers remain dry. Even the main river Bhima empties into a number of stagnant pools with ankle-deep water. However, during the peak of south-west monsoon season, not only the main streams but also the seasonal feeder streams are flooded, though for a short span of time. They bring huge volumes of coarse material inclusive of gravels and cobbles from the barren uplands and cover the shallow beds of the streams quite extensively.

Generally, the sediments in rivers are transported either as bed load or suspended load (Rajaguru *et al*., 2000; Sable, 2006).

During the course of field work in various tributaries of the Bhima Basin in 2003, encompassing the left side tributaries, the Sina and the Bori and right side tributaries, the Man and the Bor, the authors collected a number of vertebrate fossils and cultural material from various localities as given below (Fig. 1).

DESCRIPTION OF VARIOUS SITES

I. The Man River

Mudavi (N 17° 35’ 17”: E 75° 28’ 20”)

The section of the foundation of the bridge under study (16 km north of Mangalwedha Tehsil) is 3.5 -4 m thick, with a fining upward sequence of alluvium, the basal gravel bed

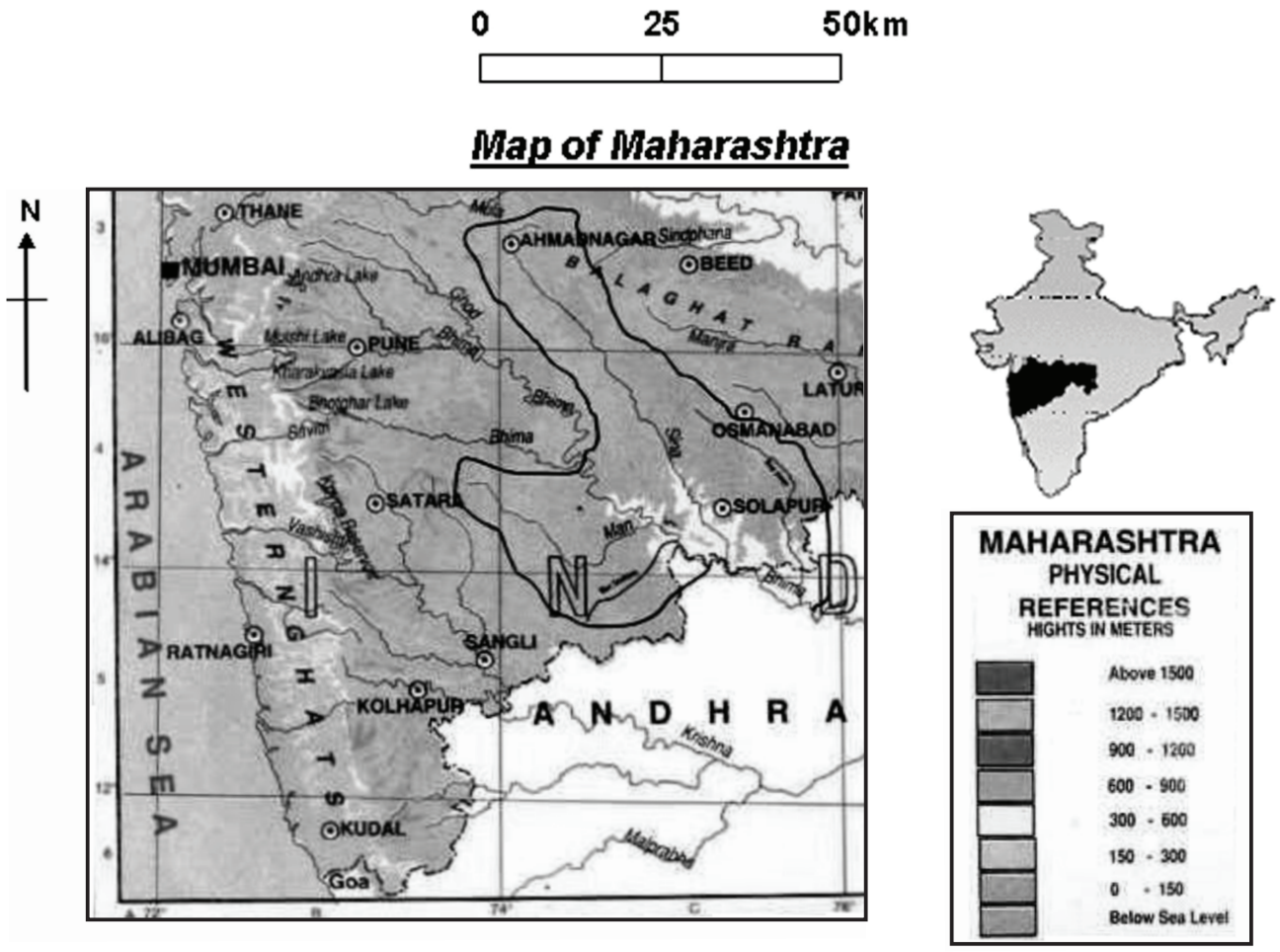

Fig 1. Locality map of the Middle Bhima valley, Maharashtra. Inset shows position in India.

followed by cemented compact and coarse sand. Three Lower Palaeolithic (large size Acheulian tools: 1 flake and 2 scrapers) and two fossils of *Bos namadicus* (nos. MDV-1 and MDV-2) were collected from this bed. The conglomerate bed, about 3 m thick, is underlain by basalt out of which about 1 m is exposed above the water level. Fossils and the Acheulian tools have been found little over 1 m above the bed rock. The overlain silt deposit is about 4 m thick which is covered by a sandy layer (Figs. 2, 3)

II. Bor River

Chadchan (N 17° 18' 33": E 75° 39' 26"; District Bijapur, Karnataka), Billondgi (N 17° 09'45": E 75° 35' 00"; District Sangli, Maharashtra) and Bhalgaon (N 17° 11' 45": E 75° 36' 30"; District Sangli, Maharashtra).

These sites are located on the main channel of the Bor River which extends for about 70-75 km from Jath to river Bhima. These sites are devoid of regular sections and hence are horizontally spread in loose gravely sand. Majority of microliths made on chalcedony and agate were found at the above sites and these include cores, blades, flakes, points etc. In addition, we collected 2 fossils of *Bos namadicus* (molars) each from Chadchan, Billondgi and Bhalgaon.

Daridevar Guda (N 16° 58' 02": E 75° 22' 10")

This site is located 27 km south-east of Jath, on the left bank of Gulganji Halla and 6 km north from Kanmadi village in Tikondi tehsil of Bijapur district. It is a primary site having yielded Mesolithic habitation deposits in the form of microlithic tools (Fig. 14), animal teeth and molluscan shells (Fig. 15). Raw material consists of chalcedony, agate, quartz and tool types are blades, cores, borers, flakes, points and scrapers. Pebbly boulder gravel deposits rest on the bed rock of basalt. Surface slope is present on eastern side and towards the Gulganji Halla stream which results in heavy soil erosion during the rainy season (see Figs. 3, 4 and 5).

Daridevar Locality A and B (Sindha Halla, Gulganji Halla)

This site is located on the left bank of Sindha Halla on Jath-Bijapur road, 26 km south east of Jath tehsil in Sangli district. Daridevar Guda is 4 km NW from this site. Palaeolithic cultural materials in the form of flakes, scrapers made on basalt have been discovered from this site (Figs. 12 and 13). Boulder pebble mixed with silt and unsorted gravel deposit is exposed on the left bank of Sindha Halla. The maximum thickness of the sections in these localities A and B is about 1m. each and these sections are unfossiliferous (see Figs. 3, 4 and 6).

III. Bori River

Bori River is a seasonal river and Bhima River is the perennial and the confluence of both the rivers takes place at 8-9 km south from the site. Black Cotton Soil is very fertile and was suitable for agricultural activity by the Early Historic people (Fig.7).

Andewadi (N 17° 39' 41": E 76° 14'15")

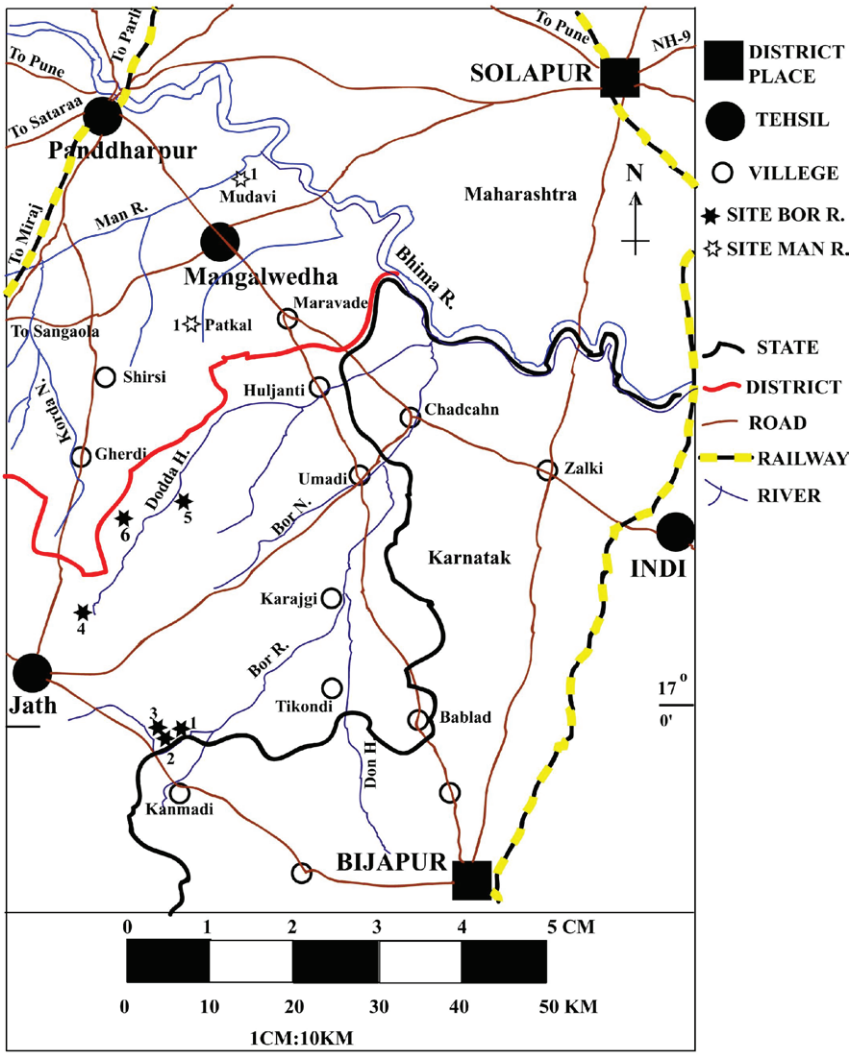

Fig. 2. Location map of Archaeological sites in Bor and Man river basins.

This site is located on the left bank of Bori River, 22 km south east from Akkalkot tehsil. Microlithic artifacts and one fossil tooth of *Equus* sp. were recovered from the river in the sandy gravel. River bed is shallow with sandy pebbly gravel and Black Cotton Soil found on both banks. The channels have suffered erosion due to loose thin deposit during the floods. River conglomerate of 30-40 cm thick sandy pebbly gravel rests on the bed rock (Fig.8).

About 10 km downstream of Andewadi is loose sandy gravel of Chincholi, similar to that of Andewadi. A few microlithic artifacts were found in the river bed along with fossil tooth of *Bos* sp.

Gaur Buzurg (N 17° 15' 07": E 76° 17' 54")

This site is located on the left bank of Bori River 14 km North West of Afzalpur tehsil of Gulbarga district. Early Historic cultural materials of Black and Red ware pottery and Red Slip ware pottery have been recovered from this site. Thickness of the habitation deposit is 1-2 m. Microlithic tools were found in abundance (see Fig. 7).

Javargi Buzurg/Khurd (N 17° 19' 38": E 76° 18' 45"**)**

This site is located on the left bank of Bori River, 22 km north west of Afzalpur tehsil in Gulabarga district. Animal teeth, bone fragments and molluscan shells (gastropods) have been discovered from the river bed in association with microlithic tools. Thick deposits of Black Cotton Soil and silt are spread around the locality due to the river streams. Cultural material recovered from this locality is found in secondary context (see Fig. 7).

Nandargi (N 17° 18' 01": E 76° 18' 31")

This site is located 18 km north west from Afzalpur tehsil, Gulbarga District on Bori River bed. One fragmentary fossil tooth has been recovered from the sandy pebbly gravel of the river bed (see Fig. 7).

The Faunal Material

Fossils have been found at several localities but are mostly found in the form of fragments, as isolated teeth, parts of limb bones etc. However, these are not beyond identification. Brief descriptions of the faunal material collected from the various localities (Fig. 9) are given below.

Man River

Mudavi

MDV-2 This is a well preserved hypsodont third lower molar of the right jaw of *Bos namadicus* (height- 65 mm, width- 36 mm, thickness- 20 mm across anterior cusp and 10 mm

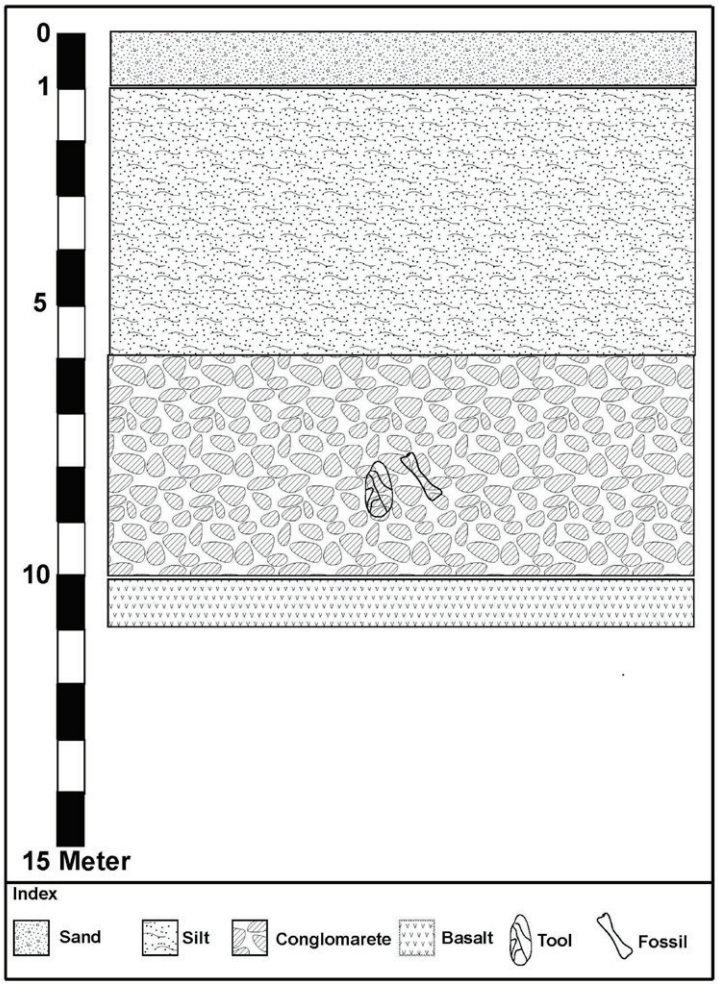

Fig. 3. Litholog of Man River at Mudavi.

across the posterior cusp). On the crown surface two prominent cusps (anterior and posterior) are well preserved, both with mild crenulations indicating the young age of the *Bos* and also the fact that the specimen has not suffered much wear. Posteriorly, the cusp tends to thin out gradually making the crown outline almost triangular. Labially, ridge and valley structure, the different styles and the interstylar faces are prominent, the mid rib of the anterior cusp being more prominent. Junction of the crown and root is well preserved. Lingually the depression between the anterior and posterior cusps is deep and runs all along the height of the crown.

MDV 1

Only one cusp (the anterior one) of the tooth of *Bos namadicus* (height- 50 mm, width- 16 mm, thickness- 19 mm) is preserved in the specimen which is mildly crenulated. The cusp is saucer shaped with well preserved loops of the enamel. The tooth seems to have been hypsodont.

II. Bor

Chadchan (CDC-2)

This is a broken molar of *Bos namadicus* (height- 45 mm, width- 24 mm, thickness- 16 mm) with only the anterior cusp and enamel loop of the posterior cusp present. The enamel of the cusp is mildly crenulated in the shape of a saucer. Labially the ridge and valley structure is poorly preserved because of erosion whereas lingually depression between the cusp ridges is pronounced. The cementing material is dark and the water activity on the tooth has rendered the surface of the tooth whitish.

Bellondagi (BLD-1)

This is an ill preserved upper molar of *Bos namadicus* (height- 30 mm, width- 30 mm, thickness- 25 mm) with two cusps whose enamel has been weathered and cementing material cracked due to taphonomic factors (water activity, sediment load, trampling , over exposure to sun, transportation and other allied factors). Cusps are rather rhomboidal with slight crenulations in the enamel. Mild ridge and valley structure is present on the labial side. Enamel of the basal pillar is somewhat damaged. Cavities of the roots are prominently round.

Bhalgaon (BLG-1)

This is a well preserved hypsodont molar of *Bos namadicus* (height- 45 mm, width- 32 mm, thickness- 24 mm) with two cusps somewhat rhomboidal in shape. Fossettes are deep, filled with cementing material and mildly crenulated. The root is broken but does preserve cavities. The basal pillar is pronounced all along the height of the molar and merges with the enamel of the crown. Ridge and valley structure on the labial side is prominent (5 ridges, 4 valleys). The colour of the surface of the tooth has been rendered reddish because of the presence of excess amount of iron oxide minerals in the soil. The tooth has not suffered much weathering.

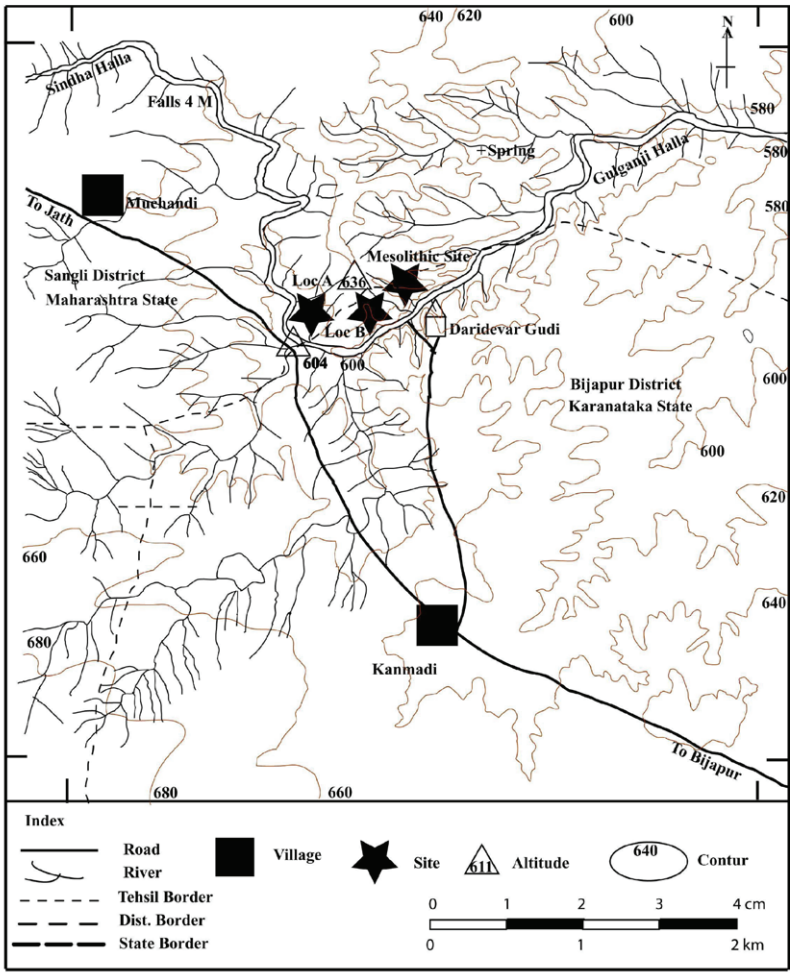

Fig. 4. Daridevara site, showing Mesolithic and Palaeolithic sites (A and B).

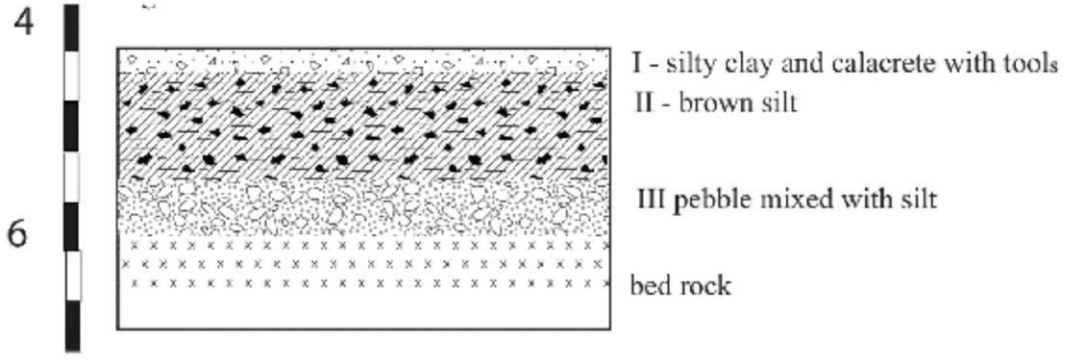

Fig 5. Litholog of Daridevara Mesolithic site. Scale is in metre.

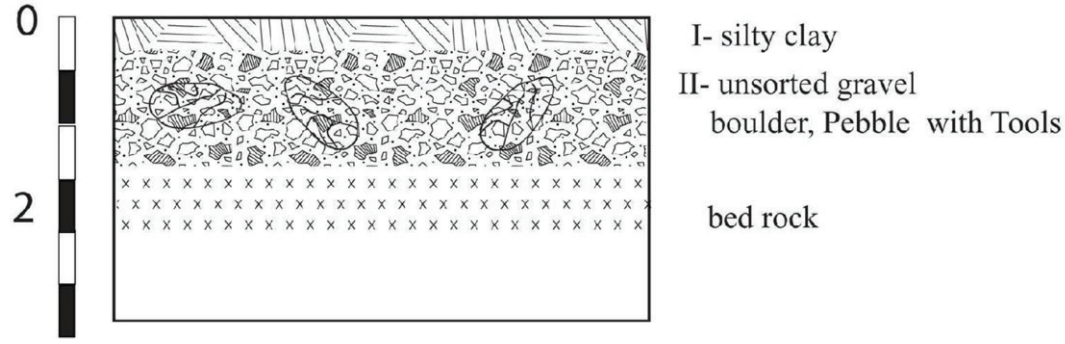

Fig 6. Litholog of Daridevara locality A and B. Scale is in metre.

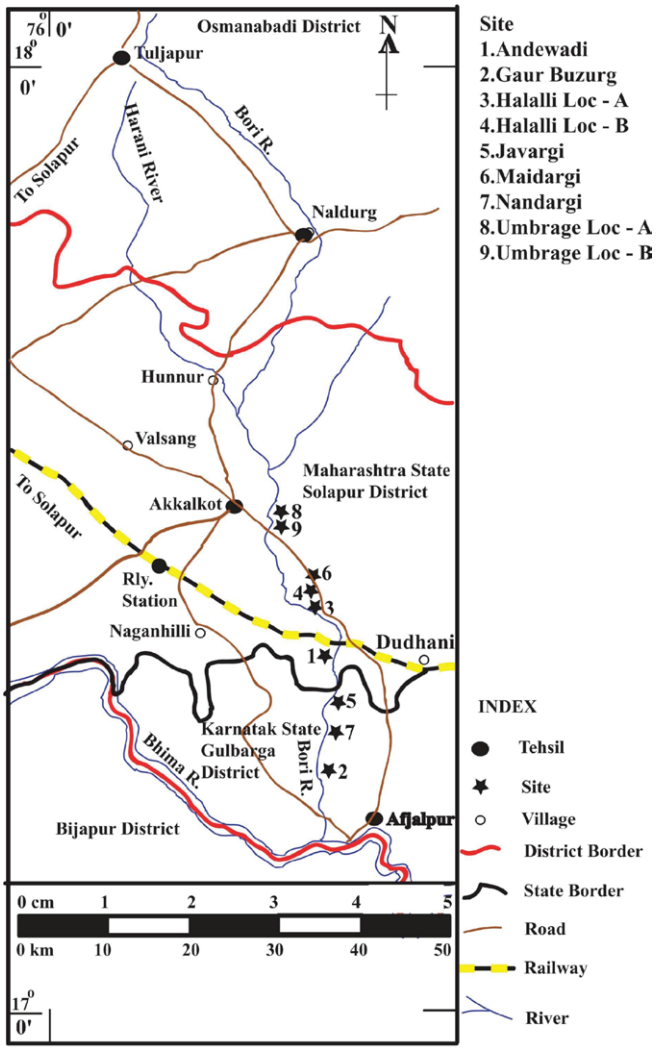

Fig. 7. Location Map of Archaeological sites in Bori River Basin.

Bhalgaon (BLG- 3)

This is a small fragment of a bovid tooth with deep cavity of the fossette. On the posterior side the mid ridge is less prominent because of erosion. The tooth (height- 33 mm, width- 10 mm, thickness- 5 mm) seems to have been hypsodont. Other features are not preserved.

Bhorgaon (BRG 2)

This is a small fragment of a tooth possibly of *Bos* sp. (height- 25 mm, width- 13 mm, thickness- 10 mm), with a compressed saucer shaped cusp. Cementing material is well preserved. Enamel is whitish in colour. The tooth seems to have suffered tranportation and other taphonomic losses.

Daridavara (DRV 1)

This is a fragment of a tooth (height- 56 mm, width- 17 mm, thickness- 15 mm), with only one cusp present which has a saucer shaped outline. The specimen has suffered rolling and transportation and is thus covered with gravelly matrix. The tooth is hypsodont and has a mid depression on the labial side all along the length of the height. This specimen appears to be that of a bovid.

DRV 4

This is the upper molar of *Equus* sp. (height- maximum- 55 mm, minimum- 43 mm; width- 16 mm, thickness- 15 mm). The crown is slightly curved so as to be accommodated in the posterior portion of the jaw. It is a hypsodont tooth, characteristic of herbivorous animals. The three styles on the labial aspect, mesostyle, metastyle and parastyle are well developed with more depressed (concave) anterior interstylar face than the posterior one. The anterior and posterior fossettes are almost rectangular in shape with mild crenulations. Plicaballin fold is elongated, has a triangular shape, is untwinned and is directed towards the left. The various cones, paracone, metacone, protocone are typically characteristic of horse dental morphology. Outline of the crown is almost squarish in shape. Root is broken.

Andewadi (AND 1)

This is a heavily weathered molar of *Equus* sp. (height- 40 mm, width- 22 mm, thickness- 15 mm), and is completely fossilized. It seems to have undergone heavy transportation affecting its shape. All styles have been obliterated. The interstylar aspects are lost as also their shape and depth. Protocone is flattened and compressed, so are the pre and post fossettes. The roots are broken. This is a good specimen for further study of taphonomic losses.

Chadchan (CCL 1)

This is a well preserved tooth of *Bos* sp. (height- 54 mm, width- 31 mm, thickness- 21 mm), Cusps are deep, roughly squarish with uncrenulated enamel. On the labial aspect the interstylar face has 5 ridges and 4 valleys though not well preserved. Some edges are partly damaged. Basal pillar is deep,

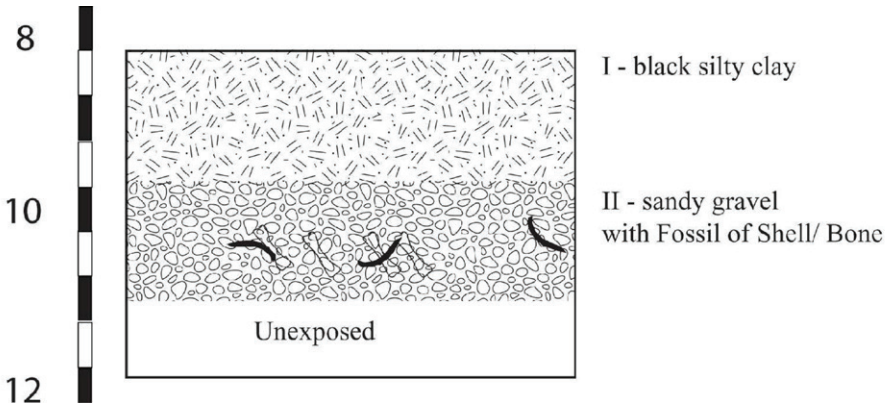

Fig. 8. Litholog of Andewadi site. Scale is in metre.

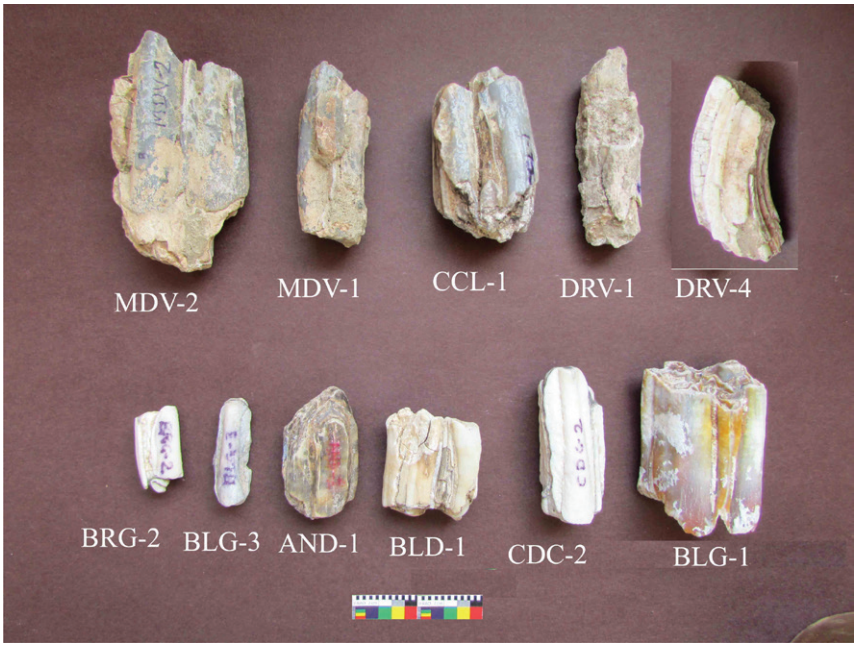

Fig. 9. Faunal material from various localities of the Middle Bhima Basin.

damaged in the lower part. Roots are broken, their cavities are filled up with cementing material. On the lingual side the ridges are prominent.

In addition to the above Palaeolithic and Microlithic sites there are a number of sites for example Maindargi (N 17° 26' 45": E 76° 16' 20") and Nanadrga (N 17° 18' 01": E 76° 18' 31") which have yielded Stone Age tools but no faunal material. Also several fossil fragments like part of limb bone with fossilized bone marrow MDV 22, incisor MDV 21, cusp of a tooth MDV 18, *Antilope cervicapra* molar MDV 20, pointed bone fragment MDV 17, molar of *Bos* sp. MDV 11, last molar of *Bos* sp. MDV 12 and other fragments have been collected from Mudavi (Figs. 10 and 11) but these are only documented here and not systematically studied. These fossils and those from other areas like Hallali, Gaudgaon, Umbarage etc. will form the subject matter of a future publication.

REMARKS

At several places in the Bhima valley, evidences of the Mesolithic, Chalcolithic, Early Historic and Medieval period have been found (Kshirsagar, 2010). From the Mesolithic period cultural material such as blades, flakes, cores, scrapers, points, borers etc. made on chalcedony, agate and chert are reported. Pottery of black and red ware, red ware along with the microlithic tools represent the Chalcolithic phase. Among the Early Historic period cultural material such as Black and Red ware, Red Slip ware etc. and from the Medieval period cultural material such as Gadhi, black, grey ware pottery are reported. An insight has also been provided into the site formation process in the various areas of the Bhima Valley on the basis of the present geology, geomorphology, soil, geo-hydrology, land-use and land-cover of the study (Kshirsagar, 2010, Rajaguru *et al.,* 1993).

The present fossil collection represents various degrees of preservation, depending on several taphonomic factors, operating upon the fauna. Some fossils are cracked, eroded and

Fig. 10. Fossil fragments from Mudavi.

modified by exposure to weathering processes. This can happen because of one or more conditions like dry climatic conditions, water logging, trampling, sediment load, transportation, siltation saltation etc. (Badam, 1994). There is, however, no evidence to suggest any human activity on the material.

It is well known that the knowledge of the modern distribution of animals has been used widely in palaeoecological reconstructions. An approximation of the past environment

Fig. 11. Limb bone fragments from Mudavi (note the fossilized bone marrow at the right end).

can be obtained by studying the period of time during which a particular species has been in existence. However, as one goes back in time this method becomes less reliable. This happens due to the climatic changes, physical and biological factors. Generally speaking studying a group of species rather than a species in isolation will give more reliable answers of a particular area. Here is what "the theory of actualism" is all about in palaeoecology.

An important aspect to be considered in this study is *taphonomy*. Large samples are necessary and the worker must be certain that the various samples to be compared were accumulated in the same manner, may be in different areas and during different periods of time. However, given the fragmentation of the bones, transportation, abrasion etc. it is not generally so. (Badam, 1996). Different species react differently to food and climate. For example in bovids longevity is affected by the degree of hypsodonty. Naturally the food of these animals was probably harsh, and largely responsible for wearing of the teeth. This can give some information about the environment.

Fig. 12. Daridavara Locality – B. Paleolithic Tool Types, DRD – 2

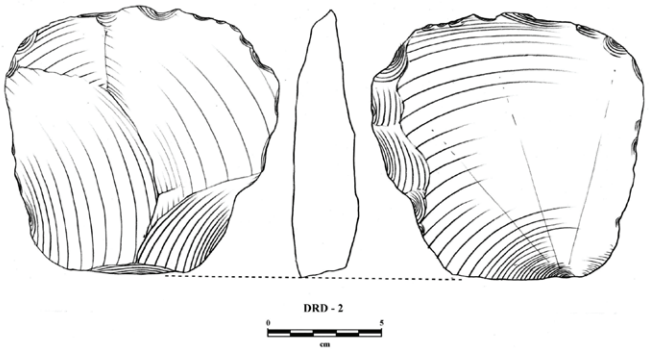

Fig. 13. Daridavar Locality – B. Paleolithic Tool Types, DRD – 2

Added to it is the specific tolerance limits for environmental factors such as salinity and temperature. Hence, adaptation (with a genetic basis) and direct effect of environment on the phenotype are the keys in palaeoecological reconstructions.

The present faunal data suggest that savannah grass land with stunted trees and thick grass on a hard ground, marshy water pools and sufficient resources in terms of water and vegetation must have prevailed in the area. In fact, this part of the valley experienced favourable ecological conditions that provided a suitable habitat for the fauna discussed above (Badam, 1984).

Fig. 14. Daridavar Mesolithic Tool Types

Fig. 15. Shell remains from Daridevara Mesolithic site on the Bor River.

Bos namadicus and *Equus namadicus* are the species which are profusely found in central and peninsular river valleys in India, the former species outnumbers all other species. *Bos namadicus* has also been reported from Mohenjodaro (2500 B.C., Sewell and Guha, 1931) and Langhnaj (2000 B.C., Clutton Brock, 1965) which suggests that the species survived long enough into the early Holocene period at certain sites before becoming extinct or giving rise to *Bos indicus* for which a strong evidence is available. In fact certain skeletal characters of *Bos indicus* like shape of the skull, length of the horns, flat orbital rims, shape of the sagittal profile etc. are also shared by *Bos namadicus* indicating an evolutionary link between the two species. It is of interest to note that *Bos namadicus* has been tentatively identified from the Mehrgarh excavations Periods I and II dated to about 6000 B.C. If confirmed this will be the only dated and reliable evidence for the survival of *Bos namadicus* into the Holocene.

Equus namadicus is an extensively found species in the Central and Peninsular river valleys. There are reports of this species also from the Siwaliks of NW India (Lydekker, 1882), Ariyalur, Tamil Nadu (Khan, 1971), Susunia, West Bengal (Sastry, 1968) and other areas. Lydekker (1883) regards *E. namadicus* as a survival from the Siwaliks. Matthew (1929), on the basis of its younger geological age, suggests that *Equus namadicus* may be a progressive form of *E. sivalensis* of the Upper Siwaliks. Azzaroli (1966) treats *E. namadicus* as a separate species on the basis of its larger and broader skull. Badam (1979) treats *E. namadicus* as a synonym of *E. sivalensis* based on biometrical and morphological studies. *E. namadicus* was also zebrine in nature like *E. sivalensis* as evidenced by a V- shaped groove between the metaconid and metastylid of the lower teeth. Though it has no relationship with the living *E. caballus,* it may be related to *Equus hemionus* (Badam, 1984, 1997).

Bos namadicus successfully exploited open and or dry habitats. They were used to several habitats but had characteristically only one dietary pattern and foraging. This controlled their movement. The ecological niches of horses and pigs (the latter found at Begumpur, about 15 km east of Manalweda on the Bhima) suggest savannah grassland for the former and stagnant marshy water pools for the latter. On the whole the palaeoecologcal conditions present during the middle-late Pleistocene period in this part of the country might not have been greatly different from those prevailing elsewhere in the valley. Further work in the area may reveal better insights for ecological reconstructions, the rate of sedimentation and water flow regime in the valley. Taphonomy of fossils on the main channels of the Bhima and its various tributaries may reveal differences in the water–sorted and water–transported bones – a study that will be useful in palaeoecological reconstructions.

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