© 2019 IJSRST | Volume 5 | Issue 4 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section : Science and Technology

Chemical Analysis of Faunal Remains in Middle Bhima Basin, Maharashtra

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ABSTRACT

Bhima River is major left side tributary of Krishana Basin. It's originated from Bhima Shankar in Sayyhadri Hills of Western Ghats at Ambegaon Tehsil of Pune district. Upper reaches area is parts of Pune and Satara district, Middle reaches area is parts of Solapur, Satara, Ahmednagar, Osmanabad, Sangali district of Maharashtra and tributary's of Bhima river, Sina, Man, Bori and Bor river. Lower reaches part is Bijapur and Kalubargi (Gulbarga), Bidar district of Karnataka. During the Geo-archaeological exploration of Middle reaches of Bhima Basin faunal remains Animal fossils, Teeth recovered from river bed, bank and dug-well. Florin, Phosphorous ratio absolute dating method are used for date of faunal remains. To understand the details of the paleoenvironment, apart from the other type of studies, Fluorine dating method is applied to understand the period of deposition. The result of this technique indicates Pleistocene Holocene climate in which the fossil is preserved in the archaeological sediment section. The significant conclusions of the bones from archaeological sites can be dated to the Late Holocene when ratio is less than 1. 2. The ratio increases to 2 or 3 in bones from the Early Holocene to terminal Pleistocene period. 3. The ratio varies from 3 to 6 in bones of the Upper Pleistocene period. 4. In the case of bones from late Middle Pleistocene and earlier periods, this ratio varies from 6.5 to 9.0. Fluorine saturation occurs beyond the late Middle Pleistocene; the theoretical saturation value of this ratio is 8.92. The present paper is deals with the multidimensional studies of the archaeo-sediment which required for the reconstruction of the paleoenvironment of the area (Kshirsagar A.A. and B.C. Deotare, 2001).

Keywords : Chemical Analysis-Faunal-Bhima Basin

I. INTRODUCTION

During the course of field work undertaken in 2015, about a dozen Quaternary sites were brought to light in the middle reaches of the Bhima basin of Maharashtra. It may be mentioned that parts of the Bhima Valley (especially the upper reaches) have received lot of attention 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 (Karha river), Bori (Kale, 1989, Korisettar, 1989, Venkatesan, 1988)(Kuakdi river) etc. The present work represents the first detailed study in the middle reaches of the Bhima which has brought to light a lot of faunal and cultural material, geological and geomorphological data and other aspects of the Quaternary geology. As mentioned earlier, the faunal and cultural material have confirmed the presence of man during the Palaeolithic and Mesolithic times in the area (Kajale *et al.,* 1976; Kshirsagar, 2015;

Kshirsagar, *et al.;* 2015; Kshirsagar, *et al.*; 2016; Kshirsagar, 2016; Sabale, 2015)

Study Area

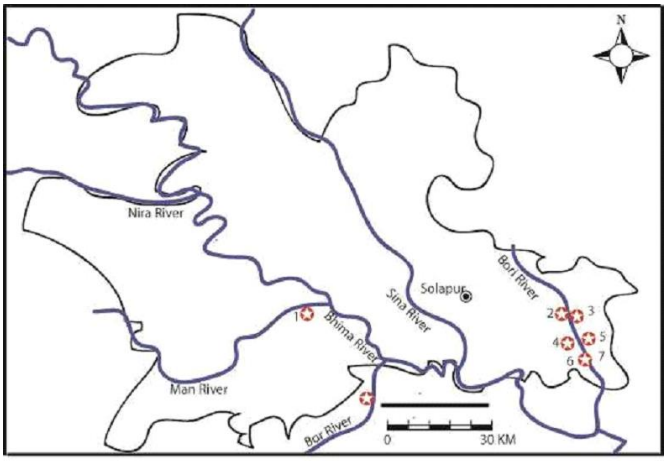
The main river in the district is the Bhima, with the Nira and Man being the right-bank and the Sina and Bori the left-bank feeders. The Bhima and the Sina flow with a roughly south-easterly trend while the Nira runs east and the Man north-easterly. During the summer season, all these rivers generally remain dry because their source areas fall under severe chronic draught prone region viz. Balaghat for Sina on the left corridor and Mahadeva from Nira and Man along the right corridor of Bhima river middle reaches. 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. These 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.

Aims and Objective

To reconstract cultural sequence middle Bhima basin
To understand subsistant pattern of study area
To date the biologicl cultural material

Research Methodology

Survery of river bed, bank and dug-wells of Bhima river and its tributory
To collect faunal material from the study area
To use releative dating method of Flourin/Phosphouous for animal bone and fossil



1. Mudhavi 2. Gaudgaon locality -A 3. Gaudgaon locality -B 3. Umbargi locality -A
4. Umbargi locality- A 5. Umbargi locality - B 6. Hallali locality - A 7. Hallali locality- B

Fig. 1 Location map of site

I- The Bori River

The following are the main sites on the river.

a. Halalli Locality A (N° 17° 25'13" E 76° 54'19''), 11 km South of Akkalkot: yielding cleavers, flakes, scrapers, from dug-well section; along right bank of Bori river
b. Halalli Locality B (N 17° 26' 01" E 76° 17'05''), 13 km SE of Akkalkot: yielding flake, scrapers, fossils from dug-well section; along left bank of Bri river section
c. Umbargi Locality A (N 17° 29'49" E 76° 14'26''), 5 km SE of Akkalkot: yielding flakes, from dug-well section; along left bank of Bori river
d. Umbargi Locality B (N 17° 56'58" E 76° 14'39''), 6 km SE of Akkalkot: yielding flakes, from dug-well section; along left bank of Bori river

The Sites:

Fig. 1: Fossil sites of the study area (1. Mudhavi

MDV 22	**N 17° 35' 17"**	**Part of limb bone**	***Bos. namadicus***	**Dug-well**
MDV 11	**E 75° 28' 20''**	**Molar**	**Bos sp**	**River bed**
MDV 12		**Last molar**	**Bos sp**	**River bed**
MDV 14		**A shaft of limb bone**		**Dug-well**

2. Gaudgaon Locality-A, 3. Goudgaon Locality-B, 4. Umbergi Locality- A, 5. Umbargi Locality- B, 6. Hallali Locality-A, 7. Hallali Locality- B)

The new sites are Mudhavi on the left bank of Man River in Mangalwedha Tehsil, district Solapur, Umbargi Locality- A, Umbargi Locality- B, Hallali Locality- A and Hallali Locality- B on Left bank of Bori river in Akkalkot Tehsil, district Solapur (Fig.1).

Umbrage Locality-B: Location of the dug well, 5 km south east from the Akkalkot- Manindargi road near the Bori River Bridge and Survey of India toposheet no. 56 C/ 3, 4, 6 and 7 on 430 MSL. Lower Palaeolithic stone tools (Cleavers) are recovered from this gravel deposit.

UBR 11: This is a well preserved upper or second molar of *Equus namadicus*. The crown is well developed and displays all the equine features. Anterior and posterior fossetts on the crown are rectangular in shape with crenulated enamel. Protocone is typically compressed and saucer shaped. All the styles, metastyle, mesostyle and parastyle are prominent with deep interstylar faces.The tooth is hypsodont, however part of the crown is broken (Fig. 2)

UBR 11A: This is a fragment of the limb bone with an effort to be made in to a tool by chipping of a portion which has been sharpened to make it into a sort of scraper (Fig. 2).

Halalli Locality- A: The site is located on the left bank of Bori river, 16 km south from the Akkalkot tehsil in Survey of India toposheet no. 56 C/7 on 420 MSL. Lower Palaeolithic tools, scrapers, flakes and cleavers made on basal rock have been discovered from the Dug-well gravel.

Stratigtraphy of the Dug-well is 5-6 m. cement construction of sediment and 6- 15 m. thick deposit of compact silty sand mixed with calcium carbonate bands. 15-17 m. thick deposit of river conglomerate, pebbly-boulder gravel rests on the basal bed rock. Palaeolithic tools are recovered from gravel which is spread around the dug well (Fig.).

Halalli Locality- B: This site is located on the Bori river bed, 4 km north from present Halalli village and 12 km south east from Akkalkot tehsil in Survey of India toposheet no. 56 C/7 on 430 MSL. Dug-well material of brown sandy-pebbly gravel is spread around the dug well area. Palaeolithic cultural materials of flake tools are recovered from this gravel. The dug well deposits are present in the second order small stream of Bori River. Lower Palaeolithic cleaver tools (Plate-3.5 a b) are recovered from this gravel. Microlithic tools are recovered from the river bed sandy pebbly gravel. Altitude is 420 AMSL and SOI toposheet number 56C/7.

Hallali Locality- A: A Dug-well was observed south of Halalli on the opposite bank of river Bori. Palaeolithic cultural material, stone tools such as scrapers, cleavers, flakes etc. were found at the bottommost layer of river conglomerate of unsorted round shaped material. The depth of tool bearing bed from the surface is approximately 20-22 m. This clearly indicates the high flood episodes in the upper reaches of Bori river.

HLI 101 and 102: These two fragments belong to a tusk portion of an elephant, *Elephas* . The incomplete nature of the specimens does not enable us to specify the species. However, the associated material with the fossils are cleavers, handaxes, flakes and cores of the Lower Palaeolithic culture and hence we may consider the elephant fragments as belonging to *E. hysudricus* from a comparative study of similar artefacts found in the neighboring areas.

The layering of the dentine in the specimens HLI 102 is straight indicating that it might belong to upper

part of the tusk, whereas in HLI 101 the lineation is circular, as generally is the case towards the tip (Fig. 3).

Specimen HLI-104 is a heavily mineralised part of the calcaneum of a mammal. The facet for the attachment of astragalus in eroded. The specimen has a rounded shape on account of erosion. The specimen seems to have been transported for some distance hence the shape. Presence of superficial linear cracks on the surface indicates exposure to sunlight and also effect of water current (Fig. 4).

Relative Dating Of Bones Found In Bhima, Man and Bori River Basin

Providing chronological framework to archaeological findings has one of the primary goals of interdisciplinary science of archaeological chemistry. Bones is an excellent material for dating by using a method of fluorine dating, which has become a standard procedure in archaeological chemistry today

(Joshi 2006-07). The examination of fluorine content in bones was initially undertaken by Morichine over two centuries ago in England. Towards the end of 19th century Carnot in France also examined the method of fluorine dating. (Middleton 1844) In India, collective efforts of the (Late) R.V. Joshi, V.d. Gogte, and A.A. Kshirasagar have given a new dimension to the subject of relative dating. The hypothesis is that there is a marked difference in the fluorine contents of bones from prehistoric to historical period, implying that the amount of fluorine in bones goes on increasing with antiquity. During the exploration around the Bhima, Man, Bori, Bor and Sina River Dr. Shivaji Dadaso Kshirsagar has found fossilized and semi fossilized bones. It was not possible to securely date of these sites in the absence of datable material and statigraphy. Bones from these sites were analyzed to put them into proper chronological framework by using relative dating technique by fluorine method.

II. CONCLUSION

Fluorine and Phosphate analysis of these samples give the ratio (100F/P2O5) in between the range of 01.31 to 15.03 (Table 1). UBR-11, Ratio ranges is 01.31 which gives the dates at Early Holocene period. MDV-14, Ratio ranges is 05.06 which gives the dates at Upper Pleistocene period. HLI-102, HLI-104, MDV-22 Ratio ranges is 7, 7.03, 7.96 which gives the dates at Late Middle Pleistocene and earlier periods. Ratio ranges is MDV-11, 11.31, MDV-12, 14.49, HLI-101, 15.03 Pleistocene and earlier period. Dr. Anupama Kshirsagar has proposed a chart correlating the fluorine values in bones with dates obtained by other dating method; it becomes clear that the bones in this study fall in the relative time scale covering a small to long time span of late to Mid Holocene period to Late Middle Pleistocene and earlier periods. Analysis indicates that these bones are semi fossilized to well fossilize. Amount of fluorine accumulation in the bone is very less to high.

This note summaries the discovery of about a dozen Quaternary sites in the Bhima basin of Maharashtra. The work represents a first detailed study of the various aspects of geology and archaeology in the region and throws important light on various areas enriching our knowledge of Quaternary aspects of the region as a whole. Several new sites discovered in this survey have added to our understanding of the prehistoric cultures in this part of India.

III.ACKNOWLEDGMENT

All authority of Deccan College Post-Graduate and Research Institute (Deemed University) Pune, Indian Council of Social Science Research (ICSSR) New Delhi, Dept. of Environment Science, SPPU, Pune and SGR Enterprise, Pune.

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Cite this article as : Kshirsagar Shivaji Dadaso, G. L. Badam , Joshi S. V., Sabale P.D. , Kale S. S. , "Chemical Analysis of Faunal Remains in Middle Bhima Basin, Maharashtra", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 5 Issue 4, pp. 110-117, ETCES-2019, January 2019.
Journal URL : http://ijsrst.com/IJSRST195425

Table 1. Fluorine and Phosphate analysis

Sr. No.	Site Name	% Phosphate	% P2o5	% Fluorine	Ratio 100x F/p2o5	Age
1	HALLALI =HLI-104	9.11	20.4	1.6	7.84	Late Middle Pleistocene and earlier periods
2	MUDHAVI =MDV-12	8.5	19.04	2.76	14.49	Pleistocene and earlier periods
3	MUDHAVI =MDV-11	8.24	18.21	2.06	11.31	Pleistocene and earlier periods
4	HALLALI =HLI-101	7.75	17.21	2.62	15.03	Pleistocene and earlier periods
5	MUDHAVI =MDV-22	12.5	27.62	2.2	7.96	Late Middle Pleistocene and earlier periods
6	MUDHAVI =MDV-14	10.1	22.32	1.13	5.06	Upper Pleistocene period
7	HALLALI =HLI-104	12.1	26.74	1.88	7.03	Late Middle Pleistocene and earlier periods
8	HALLALI =HLI-102	11.5	25.41	1.78	7	Late Middle Pleistocene and earlier periods
9	UMBARGI =UBR-11	10.3	22.76	0.3	1.31	Early Holocene

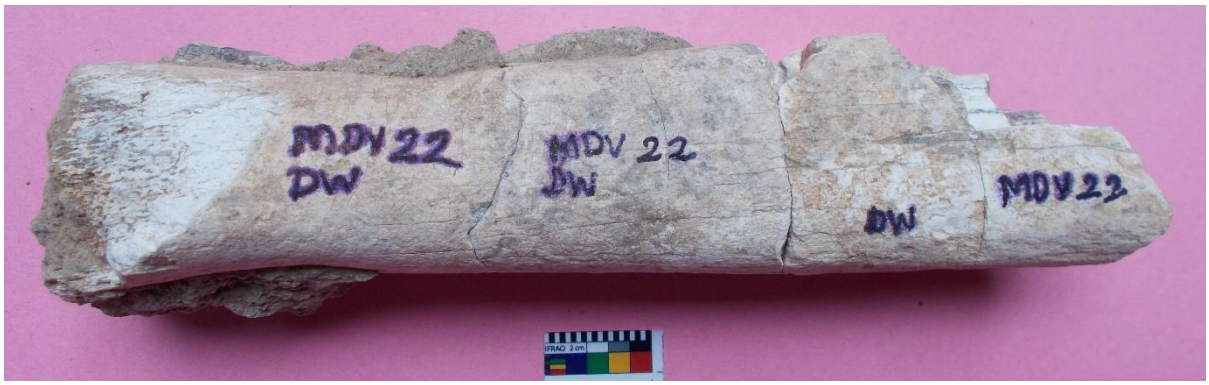

Fig. 1a MDV-22 Part of Limb Bone of Bos. Namadicus

Fig. 1b MDV -12 Last Molar Bos. sp., MDV-11 Molar Bos. sp.

Fig. 1c MDV-14,

Fig. 2 UBR-11 Upper or Second Molar of *Equus namadicus,* UBR-11A Fragment of the Limb Bone,

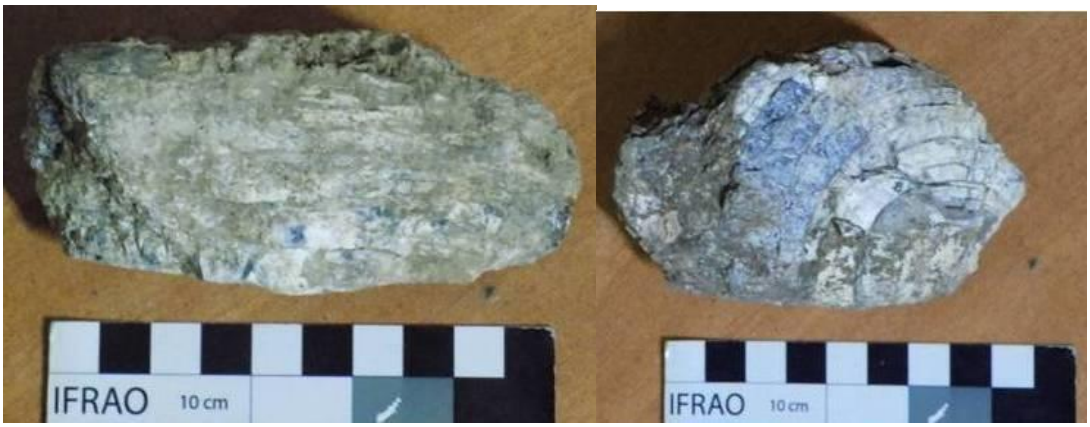

Fig. 3 HLI 101 and 102: These two fragments belong to a tusk portion of an elephant, *Elephas*

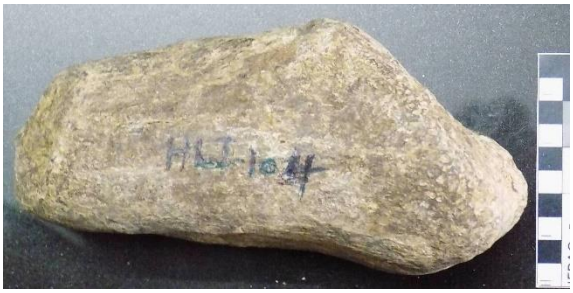

Fig. 4 HLI-104 is a heavily mineralised part of the calcaneum of a mammal.