

## Report on the faunal remains from Madina, Rohtak District, Haryana

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### 1 INTRODUCTION

The following report is based on a standard outline recommended by international archaeozoological community (Reitz and Wing 1999: 371-272). As per internationally accepted norms this report provides essential information like species identification, source of material, a brief description of the archaeological site and description of methods of laboratory analysis. This is important as the utility of archaeofaunal data for comparative studies at a general level depends on the types of methods used to collect and analyse the primary data (Clason 1972). The final data obtained after analyses has been represented and interpreted statistically and documented in tabular and graphical formats. Furthermore, the function and position held by animals in the subsistence economy of Madina is discussed. In addition, the faunal diversity at Madina is compared with those at other PGW sites in North India.

### 2 BRIEF DESCRIPTION OF THE ARCHAEOLOGICAL SITE

The village of Madina is 15 km east of the town of Meham as well as from the Rohtak district headquarters on National Highway No. 10. The village is about

90 km northwest of Delhi. A total of seven archaeological sites in the revenue jurisdiction of Madina village were noticed (Table 41; Figure 220).

The ancient site of Madina-3 is situated at a distance of about 3 km southwest of the present day hamlet of Madina, on the left side of Mokhra Minar (Figure 221). The site has a local name, that of *Khera* and a major portion of it has been extensively levelled for agricultural purpose. However, the southern part of the archaeological mound remains undamaged. This intact portion rises to a height of 1.5 m from the ground level. An estimate reveals that the site was spread over an area of 2 ha, now less than 0.5 ha is intact. Painted grey ware and Black Slip Ware can be easily picked up from the site (Surinder Singh 1989:20). However, during recent explorations, Late Harappan sherds and antiquities have also been found.

Madina-3 was excavated during February-March 2008 jointly by the Department of History Maharshi Dayanand University, Rohtak and the Deccan College, Pune under the supervision of Prof. Manmohan Kumar and Prof. Vasant Shinde, respectively (Manmohan Kumar *et al.* 2009). The excavation was undertaken to trace the linkage between the Late Harappan and Painted Grey Ware culture and to understand the settlement pattern of the latter. The digging took place in the months of February-March and Septem-

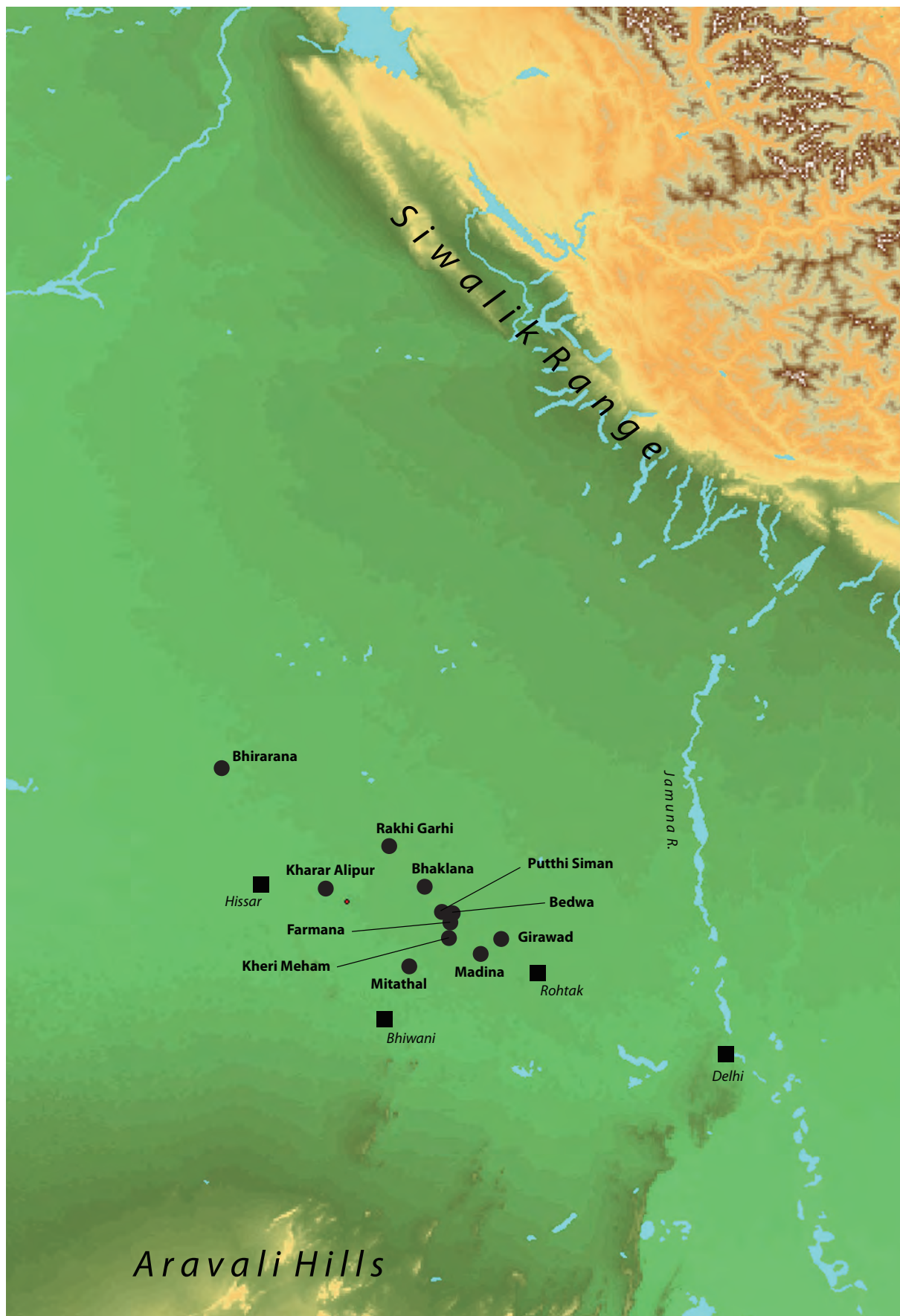


Figure 220 Location map

Table 41 Archaeological sites in the jurisdiction of Madina village

<i>Site</i>	<i>Geo-coordinates</i>	<i>Location</i>	<i>Size</i>	<i>Findings</i>
Madina-1	28°56'58.96"N; 76°25'8.24"E	1.5 km west of the village adjacent to the Mokhra Minor	1 ha	Late Harappan pottery (Surinder Singh 1989)
Madina-2	28°56'2.03"N; 76°24'57.2"E	2 km southwest of the village	3 ha	Late Harappan Ware, PGW, Black Slipped Ware and Early Historical pottery (Surinder Singh 1989)
Madina-3	28°55'11.89"N; 76°25'11.36"E	3 km southwest of the village on the left side of the Mokhra Minor	Mostly levelled for agriculture	PGW and Black Slipped Ware (Surinder Singh 1989)
Madina-4	28°55'38.42"N; 76°27'14.2"E	2 km west of the village, located on sand dune	2 ha	Medieval (Surinder Singh 1989) and Kushana pottery (Dangi 2006)
Madina-5	28°56'17.5"N; 76°27'23.8"E	2.5 km east of the village	1.7 ha	Harappan and Late Harappan pottery (Dangi 2006)
Madina-6	28°56'18.4"N; 76°24'53.05"E	1.5 km west of the village	Totally under cultivation	PGW and associated Red Ware (Dangi 2006)
Madina-7	28°57'47.55"N; 76°26'51.39"E	2 km north of the village	2 ha and levelled for cultivation	PGW (Dangi 2006)

ber 2008 (Figure 222). Horizontal excavation was carried out largely owing to the limited extent of the site and its meagre deposit. A total of 16 trenches measuring 5 x 5 m were laid out and dug. During the excavation, eight habitation phases of the Painted Grey Ware culture were exposed (Table 42). Entire faunal material recovered from all these 16 trenches was analysed.

The above table gives an overall encapsulated view of the nine layers and eight habitation phases with their respective nature of deposit. In the absence of radiocarbon dating, chronology is based on ceramic assemblage (Manmohan Kumar *et al.* 2009). An important discovery in these excavations is that of the occurrence of Late Harappan traits in the PGW period. This is not considered to be a new phenomenon since the excavations at Bhagwanpura, Dadheri, Kathpalan and Manda have yielded comparable evidences. Joshi (1993: 27-31), the excavator of Bhagwanpura, had interpreted this as an overlap of the Late Harappan and Painted Grey Ware cultures. At Madina, however, the excavators were not able to find a similar situation. The sprinkling of Late Harappan pottery in the PGW level at Madina points to the continuation

of the Harappan traits till very late in this region, as late as 800 BCE. There is about 80 cm thick deposit of PGW culture at Madina. Beginning of the PGW culture has been dated to, on the basis of comparative analysis, before c. 1400-1200 BCE.

### 3 NATURE OF MATERIAL AND ARCHAEOZOOLOGICAL METHODS

A large number of animal bones and teeth were recovered from the excavated trenches at Madina. These were collected and thoroughly cleaned on the site itself. Bias in collection, especially of smaller or broken fragments was prevented as much as possible. All bone splinters were washed using soft brushes and dried on the site itself and put in bone packets displaying their respective contexts. Fragments that were broken were immediately mended. Initially, a strategy of collecting a random sample for analysis was followed. This was done with the purpose of gaining a preliminary insight into the diversity of fauna at Madina. The sample selection was carried out by randomly picking





Figure 221 The archaeological site of Madina



Figure 222 Excavation being carried out at Madina

Table 42 Stratigraphic sequence at Madina (from Manmohan Kumar *et al.* 2009)

<i>Phase</i>	<i>Layer</i>	<i>Thickness (cm)</i>	<i>Nature of deposit</i>
I	9	30	Earliest habitation on yellowish compact kankary earth.
II	8	13	Compact in nature, light yellowish colour.
III	7	10	Brownish compact and Greyish compact floors.
IV	6	15	Yellowish compact and dark brownish compact floors.
V	5	12	Greenish ashy compact floor with ochre levelling and brownish floor with a mixture of kankars middle floor-brownish compact, later floor-greenish ashy and compact.
VI	4	20	Earliest floor-brownish and mixed with kankars, middle floor, middle floor-brownish compact, later floor-greenish ashy and compact.
VII	3	20	Mature phase of the settlement, two structural phases.
VIII	2-1	20	Last occupation phase, compact ashy, greyish and compact floor mixed with kankars. This phase is considered to be the zenith of the PGW culture.

up a few bone packets and analyses of their contents was done using a standard protocol developed at the Archaeozoology Laboratory of the Deccan College, Pune. This primary identification work was carried out at Madina during the fieldwork in March 2008 and only a few fragments were brought to the Deccan College for confirming identification with the help of the reference collection. The preliminary report for this random sample ( $n = 268$ ) was published in earlier (Joglekar *et al.* 2008). In the following year, the remaining bones were sent for faunal analysis. This report combines the results of the earlier random sample with the results of the subsequent analysis and presents it as a whole.

Initially, from each collection (archaeological context) unit the skeletal elements were classified into broader groups such as bones of axial (ribs, vertebrae and skull) and appendicular skeleton (legs). The method described by Clason (1972) has been implemented, for identifying and counting the specimens in which ancient fragments of a single skeletal element (if recognised) were not treated as separate entities. All the methods, both laboratory and subsequent analysis, are part of the protocol of faunal identification established at the archaeozoological laboratory at Deccan College since its inception in the early 1970's. Every single bone fragment was studied thoroughly and the

signatures of both pre- and post-depositional factors (like human, carnivore and rodent activity) were noted. The deliberately made fractures, cut marks as well as accidental breakage of bones both in the past and after their recovery from archaeological provenance were recorded. Marks of carnivore activity were examined in the light of unpublished observations (Sharada 2007-2008) carried out on carnivores such as hyenas, jackals, dogs and cats. All the observations including those on the bone modification were recorded in a computerised coded format. Since the computerized analysis procedure requires these units to be treated separately, these archaeological features are given unit code numbers (Table 43). Treating the archaeological features as distinct analytical units is a significant step towards discussing intra-site patterns or variability of faunal occurrence within different context. For instance, Madina has conspicuous evidences of U-shaped *chulhas*.

All the data recorded in standard paper format were keyed-in and analysed using DCPARZ – computer software developed at the archaeozoology laboratory by Joglekar (2000-2001) in the late 1980s. A standard archaeozoological system of bone identification, faunal data recording and measuring bones (von den Driesch 1976) was followed.

For species identification, the basic distinguish-

Table 43 Code numbers assigned to pits at Madina

<i>Trench</i>	<i>Feature/Structure</i>	<i>Unit Code</i>
C <sub>1</sub> II	PIT	U 30
B <sub>1</sub> II	PIT 1	U 31
B <sub>1</sub> II	PIT 2	U 32
C <sub>1</sub> II	PIT	U 33
ZD <sub>1</sub>	PIT 2	U 34
C <sub>1</sub> I	PIT	U 35
C <sub>1</sub> II	PIT	U 36

ing markers were derived from the comprehensive reference collection of animal skeletons housed at the Deccan College Archaeozoology Laboratory. If necessary, help was taken from the published distinguishing keys, e.g. Schmid (1972) and Hillson (1992) for general identification; Joglekar *et al.* (1994) for finer differentiation among the cattle, buffalo and nilgai; Prummel and Frisch (1986) for identification of bones of sheep and goat; and Pawankar and Thomas (2001) for identification of the blackbuck (*Antelope cervicapra*).

Mostly large mammalian bones could be easily identified, however, in case of closely related species like cattle (*Bos indicus*) and buffalo (*Bubalus bubalis*); goat (*Capra hircus*) and sheep (*Ovis aries*) it is difficult to assign the bone to a particular species if the bone is highly fragmented, or if the distinguishing markers are absent. Therefore, broad-level groups like *Bos/Bubalus*, and *Capra/Ovis* were created. Later on these bone fragments were added to the respective groups depending on the proportion of the identified species of these two categories. Similarly, the bones of small ruminants like sheep and goat were highly fragmented. A few bird bones have been found at Madina. These were identified using criteria prepared for distinguishing among birds up to the family level (Joglekar 1990, unpublished report).

After identification, fragments were measured, described, and those bearing marks of natural/human actions were assigned a serial number. Once the study was over, the faunal material was carefully restored

back to their respective packets and handed back to the excavator's repository so that the observations and inferences stand verifiable at any time in future. Although an attempt was made to identify the fragments using the reference collections and the species identification keys, several fragments were beyond identification, and did not fit into any of the taxa. Such skeletal elements (Unidentified fragments- UF) were grouped into three different classes. Those up to 1 cm length were called as the "small" unidentified fragments (UF-S), those between 1 and 5 cm were categorized as the "medium" unidentified fragments (UF-M), and those longer than 5 cm were treated as the "large" unidentified fragments (UF-L) (Table 44; Figure 223). The fragments that had freshly broken edges (broken after excavation) were not included in this counting procedure.

The context of these unidentified fragments and their quantification helps to understand the bone modification processes active in a site. Natural and cultural taphonomic agencies have an impact on the degree of fragmentation. The level of identification, in turn, depends on the degree of fragmentation. In case of Madina, the number of unidentifiable splinters did not account for the majority of the total bones. In other words, since the level of identification of bones was comparatively high, the quantity of unidentified specimens was very low. The UF did not vary much accordingly to the layers with respect to the total number of bones.

Out of the total 489 unidentified fragments recovered from 9 habitation layers, the proportion of differing sizes of unidentified bones did not vary much. While large splinters numbered 161, medium and small were 152 and 176, respectively. The degree of fragmentation remained more or less uniform throughout the layers. Hence site formation processes or taphonomic agents causing breakage of bones seemed to have not been excessively active in any one particular layer or period of time. Since the degree



Table 44 Madina: Summary of identification

Layer/ Unit Code	NISP	Unidentified fragments				TF
		Large	Medium	Small	Total UF	
1	69	7	6	5	18	87
2	1033	105	92	123	320	1353
3	368	28	31	34	93	461
4	30	1	6	1	8	38
5	28	1	3	3	7	35
6	103	7	6	8	21	124
7	51	8	3	2	13	64
8	33	4	4	0	8	41
9	11	0	1	0	1	12
Unit Code 30	32	6	2	2	10	42
Unit Code 31	89	3	2	2	7	96
Unit Code 32	7	2	3	6	11	18
Unit Code 33	84	8	6	10	24	108
Unit Code 34	17	3	2	0	5	22
Unit Code 35	29	5	2	3	10	39
Total	1984	188	169	199	556	2540

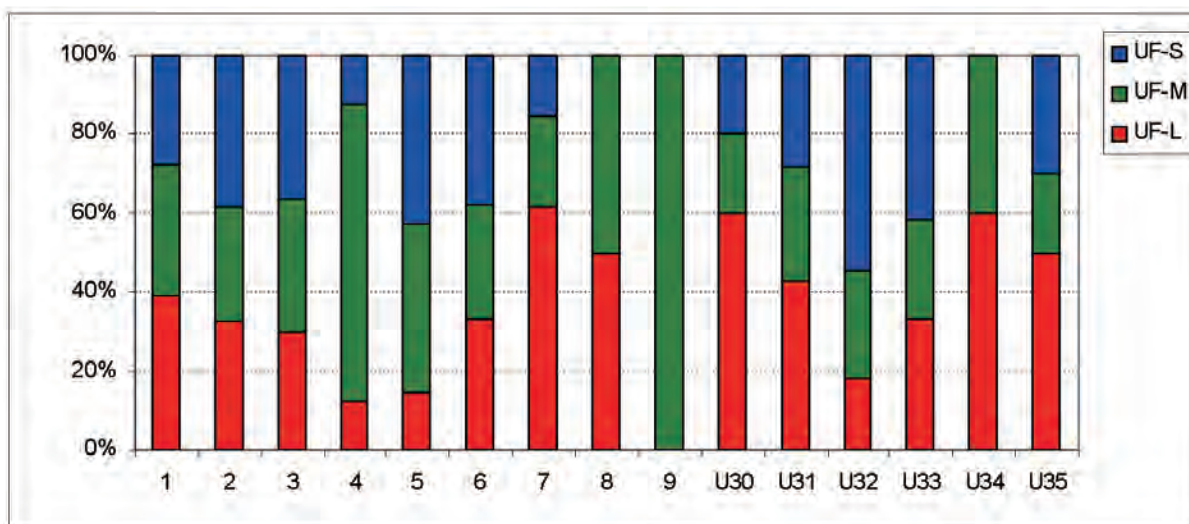


Figure 223 Layer-wise distribution of unidentified bones at Madina

of fragmentation is moderate, it reflects on the fairly good preservation and condition of bones at the site. Also, it can be observed that even among the unidentified bones, very few showed signatures of any form of modification or digenetic changes. Only three bones were charred - two large and one medium-sized fragment. These came from the layers 6, 5 and 2.

In other coded contexts, out of the total 67 bones which were unidentified, 27 were large, 17 medium and 23 small splinters. More number of large

and small fragments indicates some minor disturbance (further discussed under bone modifications). An interesting observation was that there were no charred unidentifiable splinters recovered from pits, hearths or other such features. Two points came to the fore from this set of data. Firstly, in layer 9, which corresponds to the earliest occupational phase, almost all bones could be positively identified except one medium-sized fragment. However, in the case of the pit coded U32, in layer 2, the number of unidentified

Table 45 Bone modifications observed in layers 1-9 at Madina

<i>Layer</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>Total</i>	<i>%</i>
Slightly charred	5	47	8		5	5	1	2	0	73	4.22
Completely charred	3	83	14	3	1	3	1	2	0	110	6.37
Charred and vitrified	2	5	6	1	0	0	0	0	0	14	0.81
Butchering marks	0	7	2	0	0	2	0	0	0	11	0.63
Cut marks	14	126	48	3	3	12	7	4	2	219	12.68
Rodent teeth marks	1	0	0	0	0	0	0	0	0	1	0.05
Bone tools	2	3	7	0	0	0	0	0	0	12	0.69
ornaments	1	0	1	0	0	0	0	0	0	2	0.11
Carnivore marks	1	1	0	0	0	0	0	0	0	2	0.11
Gnawing marks	1	5	1	0	0	0	0	0	0	7	0.40
Embryonic	0	2	0	0	0	0	0	0	0	2	0.11
Pathological condition	0	0	1	0	0	0	0	0	0	1	0.05

% calculated w.r.t. n = 1726

Table 46 Bone modifications observed inside features (unit codes 30-35) at Madina

<i>Layer</i>	<i>U30</i>	<i>U31</i>	<i>U32</i>	<i>U33</i>	<i>U34</i>	<i>U35</i>	<i>Total</i>	<i>%</i>
Slightly charred	5	3	0	9	0	2	19	7.36
Completely charred	6	6	1	4	2	6	25	9.68
Charred and vitrified	0	0	0	0	0	1	1	0.38
Butchering marks	0	1	0	1	0	0	2	0.77
Cut marks	4	12	1	13	3	4	37	14.34
Gnawing marks	0	0	0	1	0	0	1	0.38
Later intrusion	0	0	3	0	0	0	3	1.16

% calculated w.r.t. n = 258

bones were more than the identified ones. Otherwise, overall, the ratio of unidentified to identified remains more or less constant as we move from layer to layer and from one coded unit to another.

#### 4 FAUNAL IDENTIFICATION

From the 16 excavated trenches, a total of 2540 skeletal elements were examined of which only 556 remained unidentified and nearly 1984 elements could be identified (Table 44; Figure 224). The level of identification (78.11%) is sufficient enough to remark on the diverse nature of the fauna at Madina. In fact, when compared with the other nearby sites, this level of identification is quite high. One of the reasons is that the bones are well-preserved and mostly devoid of any encrustations. From the table below it is clear

that the maximum number of bones, nearly 75% come from layers 1, 2 and 3 with pits belonging to them coded U31, U33. These layers correspond to the habitation deposit of the most mature phase of the culture. The next peak, which is a sudden rise in the quantity of bones, occurs in layer 6.

#### 5 BONE MODIFICATIONS

All skeletal elements were scrupulously examined for any remnants or patterns left behind by natural and cultural including anthropogenic bone modifying agents. A few bones provided evidences of depositional and post-depositional processes (Table 45; Figure 225 - 230). The bones were also studied for any pathological condition. Several fragments, particularly of large animals such as the cattle and buffalo (humerus,



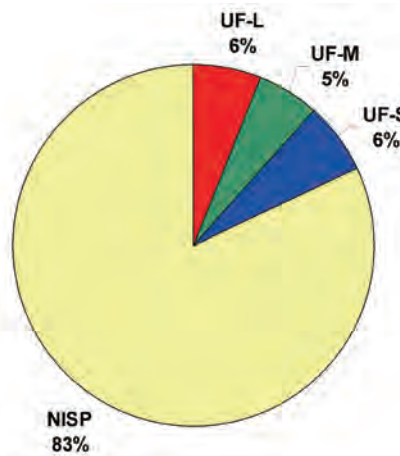


Figure 224 Relative proportion of identified fragments at Madina

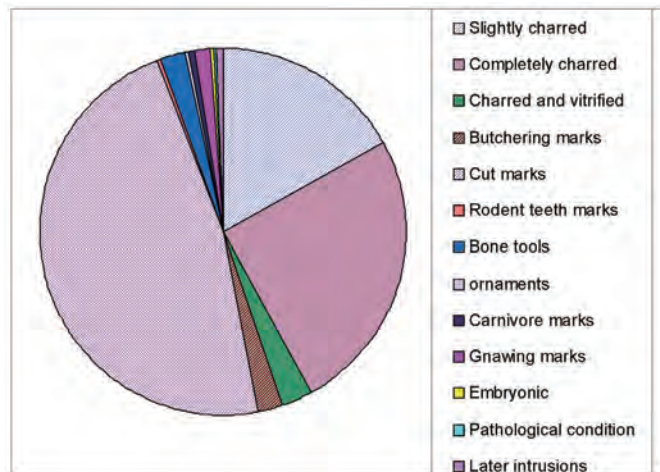


Figure 225 Bone modifications observed at Madina

tibia, mandible and metapodia) were cut and a few have been fashioned as tools. Although finished bone tools are very few in number, a number of fragments indicate that these could be unfinished/unused tools. These have been labelled attempted tools or tools with no use-wear marks on them. A careful examination of the large fragments indicates that these could have been utilised to make bone tools.

Layer 9 yielded meagre evidence of bone alterations. This is important because with a fairly thick deposit of nearly 30 cm deposit, this layer represents the earliest phase of occupation at the site. The excavators have unearthed a floor level in this layer. Only two bones, one metacarpal shaft and one cattle/buffalo tibia have cut marks on them.

In layer 8, the frequency of bones having charring and/or cut marks is increased (Figure 231). Three cattle bones (a femur, a pelvis and a vertebra) and a sheep/goat femur showed various degrees of charring - from partial to complete. The cattle vertebra also has a cut mark. Other bones having cut marks include a cattle/buffalo cranial fragments and sheep/goat femur. All these bones are meat-bearing parts and such modifications attest the fact that these animals were consumed. Layer 7 also reveals a similar picture. However, here the bones which had cut marks or charring

on them were different than those in the previous layer, i.e. scapula, rib, mandible, and cranial fragments, all of cattle or buffalo. Apart from the regularly occurring bones of cattle, buffalo, sheep and goat, meat-bearing and non-meat bearing parts (a charred humerus of leopard/panther and a cervical vertebra with cut marks of sambar) were found. These animals were probably hunted on an occasional basis or when and if the animal was spotted accidentally strayed near the settlement.

Layers 3, 2 and 1 correspond to the mature phase of the settlement with conspicuous evidences of floors, structural activity, U-shaped *chulhas*, oval hearths (*baras*), typical PGW antiquities, animal terracotta figurines, shell and bone bangles, and fish hooks, etc. Incidences of degrees of charring up to the point of vitrification are found in abundance. Bones with cut marks also increase. A solitary case of pathology was seen in a cattle maxilla from trench C1 (layer 3). This maxillary fragment had an extra tooth projecting towards the buccal side.

Although no rat remains were found in this sample, rodent (house rat/ bandicoot rat) modification signatures were seen in case of a scapula of cattle/buffalo found from layer 1 in trench D1. Two skeletal elements showed signatures of carnivore bone



Figure 226 Evidence of trampling and charring at Madina

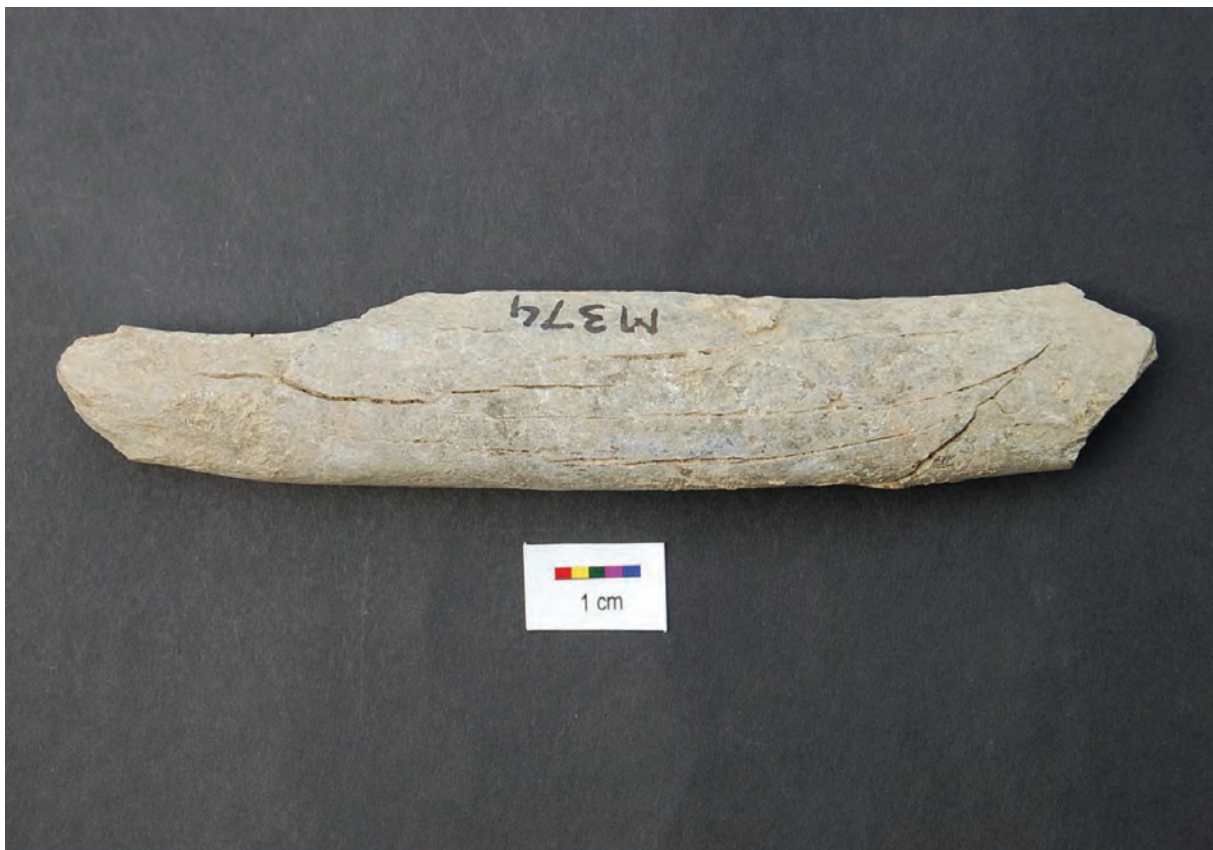


Figure 227 An example of cracks observed on bone surface





Figure 228 Cut marks observed on some skeletal elements at Madina



Figure 229 Mark of puncture due to carnivore tooth



Figure 230 Bone tools

modifications - a cranial fragment of cattle/buffalo from layer 1 and the distal end of tibia of domestic pig found from layer 2. Such modifications can be clearly distinguished if tooth marks are present. In this site, the bone with carnivore chewing has a puncture – a circular hole probably made by the canine. Similarly, only two objects were found. One is a shell bangle. The sample examined and the collections seen at the site did not show any shell waste, thus indicating that the shell bangles were not manufactured at Madina. The other object has been fashioned from a cattle/buffalo mandible. It is flat and has a toothed/serrated saw-like edge. There is a possibility that this object was used to incise wavy designs on the outer surface of pottery.

The data for bone modifications of bones inside distinct archaeological contexts is as expected. However, what strikes instantly is the absence of bone tools and ornaments. This is probably for a valid reason

that such important artefacts or precious objects were not discarded easily and subjected to use and reuse after repair. There were three bones (femur, pelvis and tibia), of a bandicoot rat in a pit (trench B1 II). These are later intrusions and have got incorporated along with the archaeofaunal assemblage. A majority of the bones from the pits, hearths and *chulhas* are charred. Nearly 15% of them also show cut marks. These bones are mostly non-meat bearing parts of large mammals like cattle and buffalo.

In some cases at archaeological sites a few fragments show the impact of post-depositional factors such as trampling, erosion and rolling and abrasions due to contact with sand particles and weathering due to physical movements within the sediments. Trampled bones have a typical overlapping surface as the outer surface gets pushed one below the other when fresh. A Madina a few bones exhibited dendritic or sinuous patterns caused by the growth of roots and



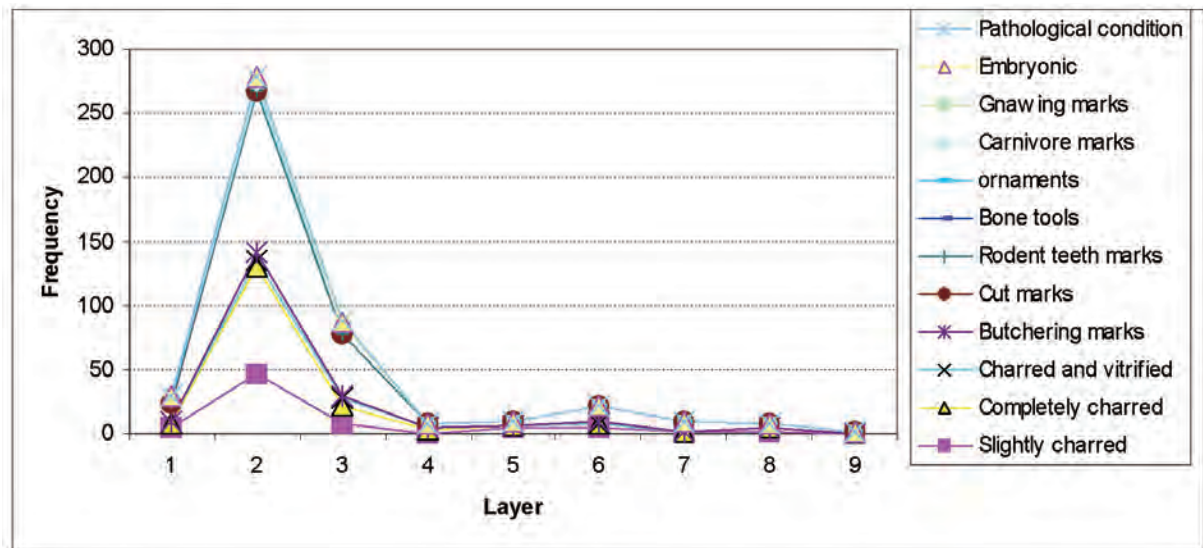


Figure 231 Layer-wise distribution of modified bones at Madina

rootlets over or inside them.

## 6 THE SPECIES

The diversity of fauna in this ancient site can be attested to by the presence of many animal taxa which include mammals, birds, reptiles, fishes and molluscan species (Table 47, Figures 232 - 243). A total of 31 species were identified. These include twelve wild animals (nilgai, chital, sambar, four-horned antelope, blackbuck, gazelle, wild pig, hare, fox, leopard, rhinoceros, and palm cat), three reptiles (turtle, gharial, and monitor lizard), and nine domestic species (cattle, buffalo, sheep, goat, pig, and dog cat, ass and horse). The faunal material recovered from Madina has a large number of non-mammalian remains. These include reptile and fish besides birds and molluscan shells. However, it was possible to identify many such skeletal elements up to the genus or species level. All such skeletal elements were examined again in the lab for secure identification with the aid of the reference specimens. Birds (cattle egret and peafowl), reptiles (turtle, gharial, and monitor lizard), and molluscs comprise the latter category.

There were some bones that could not be pos-

itively identified till the species level. These include three small mammal bones found in pits, one general mammal bone and one general reptile bone from layer 2. Interestingly, at this particular site no fish remains were recovered from the excavation. This could either be due to selective recovery of large bones from the site while digging or non-preference and non-consumption of aquatic fauna by the ancient inhabitants. It is difficult to imagine that with many water bodies in its vicinity rich in aquatic fauna like fish was not exploited by the ancient population to supplement their dietary requirements. Yet the faunal material recovered includes small fragments of molluscan shells such as of *Pila globosa* and *Lamellidens* sp. The observation that both these species were exploited but not the fish at all remains unexplained unless we assume that some cultural reason like a cultural taboo might have been the cause.

## 7 NUMBER OF IDENTIFIED SPECIMENS

Table 48 gives a comprehensive profile of the different species found in all the layers at Madina. It also takes into account the animals found in other contexts (pits)



Figure 232 Bifid spine of the thoracic vertebra of humped cattle



Figure 233 Humerus bones of cattle





Figure 234 The proximal end of cattle tibia



Figure 235 Bones of buffalo



Figure 236 Bones of goat



Figure 237 Bones of sheep





Figure 238 Horse bones



Figure 239 Bones of blackbuck





Figure 240 Mandibles of gazelle



Figure 241 Panther humerus





Figure 242 Reptile vertebra



Figure 243 *Lissemys punctata* (left) and *Lamellidens* sp. (right)

Table 47 Animal taxa identified at Madina

<i>Domestic Mammals</i>	<i>Wild Mammals</i>	<i>Birds</i>	<i>Reptiles</i>	<i>Mollusca</i>
<i>Bos indicus</i>	<i>Boselaphus tragocamelus</i>	<i>Pavo cristatus</i>	<i>Lissemys punctata</i>	<i>Pila globosa</i>
<i>Bubalus bubalis</i>	<i>Axis axis</i>		<i>Gavialis gangeticus</i>	<i>Turbinella purum</i>
<i>Capra hircus</i>	<i>Cervus unicolor</i>		<i>Varanus bengalensis</i>	<i>Lamellidens sp.</i>
<i>Ovis aries</i>	<i>Tetracerus quadricornis</i>		<i>Trionyx gangeticus</i>	
<i>Sus domesticus</i>	<i>Antilope cervicapra</i>			
<i>Canis familiaris</i>	<i>Gazella bennetti</i>			
<i>Felis catus</i>	<i>Sus scrofa</i>			
<i>Equus caballus</i>	<i>Lepus nigricollis</i>			
<i>Equus asinus</i>	<i>Vulpes vulpes</i>			
	<i>Panthera pardus</i>			
	<i>Rhinoceros unicornis</i>			
	<i>Viverricula indica</i>			
	<i>Bandicoota indica</i>			

which have been coded as special units for better analysis.

#### *Phase I (Layer 9)*

This particular phase is important as it represents the earliest occupation levels. However, the number of identified fragments is only 11 (Table 48). In layer 9, domestic animals were exploited. There are cattle/buffalo and sheep/goat bones although in small quantities. Only one wild animal has been identified, i.e. a gazelle. The evidence is in form of a metacarpal and a metatarsal of gazelle from trench D1. But it does not have marks of butchering, cutting or charring. Since overall frequency of bones in this layer is small, it is not possible to comment on relative use of wild and domestic animals.

#### *Phase II (Layer 8)*

Bones from this phase (n = 33) are more than the previous phase. Yet these are inadequate to make quantitative assessment of animal-based subsistence. A majority of these fragments belonged to cattle and buffalo. The ribs and vertebrae are more in number while other bones like that of the hind and fore limbs; teeth and cranial fragments comprise the rest of the bones. In this phase four fragments of small ruminant were recovered, however, it is not possible to securely

identify any of these as of sheep or goats. A fragment of right orbital bone of horse was recovered from trench D1. This fragment is devoid of any marks.

#### *Phase III (Layer 7)*

Layer 7 yielded a total of 51 identified fragments, of which the cattle/buffalo were the majority. In this layer 7 fragments of small ruminant were recovered, and it was possible to securely identify one fragment of a goat and three fragments of sheep. Here also, the ribs and vertebrae are more in number while other bones like that of the hind and fore limbs; teeth and cranial fragments are relatively few. In this phase an astragalus of rhinoceros was recovered from trench D1 (MDN119). This fragment does not have any marks of utilization. By looking at the condition of this bone, it is suggested that this fragment could have been collected by the inhabitants and brought within the settlement.

#### *Phase IV (Layer 6)*

In this layer the number of bones recovered increase two-fold when compared to the previous layer (7). The proportion of domestic animals outnumbers those of wild. Similarly the variety of animal species also is increased. The animals found in this phase include cattle, buffalo, sheep, goat, spotted deer,



Table 48 Madina: Number of identified specimens

<i>Layer</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>Pits</i>	<i>NISP</i>
<i>Bos indicus</i>	14	185	87	6	4	20	13	8	1	36	374
<i>Bos/Bubalus</i>	39	557	200	13	15	72	30	19	5	162	1112
<i>Bubalus bubalis</i>	2	31	13	0	2	0	0	1	0	11	60
<i>Capra hircus</i>	0	7	7	2	0	1	1	0	0	4	22
<i>Ovis aries</i>	2	10	2	0	0	0	3	0	0	0	17
<i>Capra/Ovis</i>	5	166	36	8	2	7	3	4	3	21	255
<i>Sus domesticus</i>	0	2	1	0	0	1	0	0	0	0	4
<i>Canis familiaris</i>	0	9	1	0	0	0	0	0	0	1	11
<i>Equus caballus</i>	0	6	1	0	0	0	0	1	0	2	10
<i>Equus asinus</i>	0	0	0	0	0	0	0	0	0	1	1
<i>Felis catus</i>	0	1	0	0	0	0	0	0	0	0	1
<i>B. tragocamelus</i>	2	6	1	0	0	0	0	0	0	4	13
<i>Axis axis</i>	3	2	2	0	0	0	0	0	0	1	8
<i>Cervus unicolor</i>	0	1	0	0	1	1	0	0	0	1	4
<i>T. quadricornis</i>	0	0	0	0	0	0	0	0	0	1	1
<i>A. cervicapra</i>	0	27	5	1	3	0	0	0	0	4	40
<i>Gazella bennetti</i>	0	7	1	0	0	0	0	0	2	0	10
<i>Sus scrofa</i>	0	3	0	0	0	0	0	0	0	1	4
<i>Vulpes vulpes</i>	0	1	0	0	0	0	0	0	0	0	1
<i>Panthera pardus</i>	0	1	0	0	0	1	0	0	0	0	2
<i>Lepus nigricollis</i>	0	4	3	0	0	0	0	0	0	4	11
<i>Viverricula indica</i>	0	1	0	0	0	0	0	0	0	0	1
<i>Bandicota indica</i>	0	0	0	0	0	0	0	0	0	3	3
<i>R. unicornis</i>	0	0	0	0	0	0	1	0	0	0	1
<i>Pavo cristatus</i>	0	3	0	0	0	0	0	0	0	0	3
<i>T. gangeticus</i>	1	1	0	0	0	0	0	0	0	0	2
<i>L. punctata</i>	0	1	4	0	0	0	0	0	0	0	5
<i>V. bengalensis</i>	0	0	0	0	0	0	0	0	0	1	1
<i>G. gangeticus</i>	0	0	1	0	0	0	0	0	0	0	1
<i>Lamellidens sp.</i>	0	0	2	0	1	0	0	0	0	0	3
<i>Pila globosa</i>	0	1	1	0	0	0	0	0	0	0	2
<i>T. pyrum</i>	1	0	0	0	0	0	0	0	0	0	1
Total	69	1033	368	30	28	103	51	33	11	258	1984

sambar, domestic pig, and leopard. Many interesting observations were made with regard to the kind of bones and their modifications regarding these species. Cattle bones, especially ribs and vertebrae, were plenty. Ribs were found to be of large size. Other bones like humerus, femur, tibia, radius, cranial fragments, and phalanges were also present. Only one skeletal element of goat was found. It is the left scapula bearing cut mark from the ZD1 trench. The other bones recorded as sheep/goat are mostly ribs, radius, ulna and scapula.

For the first time at Madina in this phase there is introduction of domestic pig. Domestic pig is represented by a complete canine of the lower jaw.

Not much can be discussed regarding this animal as the skeletal element representing is a single tooth, and there is no additional information regarding any bone modification. Deer like sambar were hunted. A single cervical vertebra which has been cut into two was found in trench D1. This animal was consumed as indicated by the cut marks. The bone identified as that of the leopard is interesting. It is the fused distal portion of the right humerus from trench D1. It is completely charred. This carnivore may have entered the settlement for poaching on the livestock. Madina people have killed this poacher and eventually have consumed it.

**Phase V (Layer 5)**

The number of fragments found from this phase is strikingly small as compared to the previous and later layers. Only 28 identifiable fragments were there apart from 7 unidentified ones. Cattle, buffaloes, sheep and goats continue to be the food animals in this phase. The evidence of blackbuck being hunted/ trapped appears for the first time in this phase. A right side distal portion of the humerus of blackbuck (*Antelope cervicapra*) was found here. It not only has a cut marks but is also charred. Besides the antelope, the sambar (*Cervus unicolor*) is represented by a solitary maxillary second molar (M139) that is completely charred. This phase also has a solitary fragment of freshwater bi-valve shell of *Lamellidens* sp.

**Phase VI (Layer 4)**

Total number of skeletal elements found in this phase is also small like the previous phase. Out of 38 fragments 30 were identified (Table 48). Of these only a single fragment belonged to wild animals, i.e. left side mandible fragment with third molar of a blackbuck female of medium age (M143). Among the domestic animals, only cattle and goats could be identified.

**Phase VII (Layer 3)**

The number of identified fragments in this phase is large (n = 364) and also the diversity of animals is more in this phase (Table 48). The proportion of domestic animals is higher than the wild animals. Major share of the skeletal elements comes from the cattle and buffalo. Together these two important food species, contributed 82.42% of the NISP. Of these the proportion of buffalo bones (n = 13) is small as compared to cattle. Sheep and goats seem to be the next important domestic species in this phase. Together these two species contributed 12.36% of identified specimens. Besides these species domestic pig has been found in this phase. A single canine tooth of lower jaw of domestic pig was found from trench C1.

The other domestic animals found from this phase are the horse and the dog. A fragment (broken during excavation) of the first phalanx (M188) of the horse is devoid of any marks and seems to have been associated in the debris accidentally. The dog is represented by a fragment of scapula recovered from trench B1. It belongs to an adult and does not carry any mark related to food activities. It is clear from these observations that both the dogs and the horses were not consumed at Madina.

Five wild mammalian species utilized for food in this phase were the nilgai, spotted deer, blackbuck, gazelle and hare (Table 48). The nilgai appears in the faunal record at Madina for the first time in this phase. A single fragment of right side horn core of the perhaps a male (M180) was found from trench D1. Similarly, the gazelle has been represented by a single mandibular molar in trench (M198). Five skeletal elements of the blackbuck were found in this phase. Except one (M161) proximal end of metacarpal of an adult buck all others showed marks of charring and cutting activities. Three very small fragments of the hare were found from deposit of this layer, of which a maxilla (trench D1) and tibia (trench B1) showed cut marks. In this phase four non-mammalian remains were found – two vertebrae of the gharial (*Gavialis gangeticus*) fused together, four carapace fragments of the Indian mud turtle (*Lissemys punctata*), two shell fragments of freshwater mussel (*Lamellidens* sp.) and a gastropod shell of *Pila globosa*.

**Phase VIII (Layers 2 and 1)**

Most of the faunal material examined from Madina comes from this phase (i.e. 1102 out of 1984 NISP). This last occupation phase at Madina is considered to be the zenith of the PGW culture. The proportion of domestic animals is higher than the wild animals. The proportion of domestic animals is 92.74% of the NISP (Table 48). All the domestic species found in the earlier phases continued to be the mainstay of the

food economy in this phase. These are cattle, buffalo, sheep, goat and pig. Major share of the skeletal elements comes from the cattle and buffalo. Together these two important food species, contributed 75.14% of the NISP. The relative proportion the buffalo is not very substantial and less than one-sixth of the cattle (Table 48).

Analysis of the epiphyseal fusion data indicates that cattle of all age groups were culled, of which the most common culling age was 24 to 30 months. Sex determination was not possible at all at Madina, however, both cows, bulls and castrates were present. A good number of cattle bones were charred to various degrees and with cut marks indicating that the cattle were culled for meat. Only a few fragments were charred to such a degree that they were vitrified. Some fragments show cracks due to over-firing. Some bones of these animals were perhaps used for manufacturing of tools as attested by several unidentified cut fragments.

Like the previous phase, sheep and goats were the next important domestic species in this phase (17.24% of NISP). It was possible to identify 7 and 10 fragments as of goat and sheep, respectively. Age estimates of these two species show that animals of 6 months to 12-15 months were culled quite often. This suggests that the sheep and goats were valued for their meat more than other products. As it has been seen throughout the history of occupation at Madina, contribution of the domestic pigs was marginal. In this phase also only two fragments of this animal (tibia and pelvis) were found from layer 2. Of these the distal end of tibia (M49) showed a cut marks and was charred.

The two non-food domestic species, in this phase like the previous phase were the dog and the horse. Apart from these two species, domestic cat (*Felis catus*) has been found a new in this phase. A solitary mandible fragment of this pet species was found from trench B1. This fragment has no marks

of any modification. Among the 9 identified bones of dog there are fragments of scapula, humerus, radius, femur, calcaneum, and mandibles. Of these, two skeletal elements (a mandible and a radius) belong to two different young puppies, perhaps less than 3-4 months old. None of these bear any marks of cutting and butchering activities. Thus it is clear that the dogs were not consumed at Madina. Six bones of horse were identified from layer 2. The skeletal elements are mostly vertebrae and cranial fragments. These include a cervical vertebra from trench C1 II whose edges are eroded, three fused lumbar vertebrae from C1 II and B1 IV, and one cranial fragment (trench B1). One of the cervical vertebrae recovered from trench D1 has clear signatures of charring and cutting activities. It is difficult to comment on routine consumption of horse meat based on a single occurrence of such a fragment with clear cut marks. However, a possibility of occasional or ritualistic consumption can not be ruled out.

As mentioned earlier, the relative proportion of wild animals is small (6.08% of NISP) as compared to domestic animals in this phase like the previous phases. However, among the wild animals, the most important species utilized was blackbuck (*Antelope cervicapra*) and the gazelle (*Gazella bennetti*) and nilgai (*B. tragocamelus*) were the next important wild animal species. Several skeletal elements of all the three species show marks of cutting and charring. The other wild mammals hunted and consumed in this phase were two deer species (*Cervus unicolor* and *Axis axis*) and the wild pig. Wild pig bones include two mandible fragments, one with third molar, and the other one has deciduous teeth in it.

Two wild carnivore species found in this phase (trench C1) were the leopard and the fox. Both these were represented by a single mandible fragment each. Both these fragments - the leopard mandible (M62) and the fox mandible (M61) showed charring marks. As has been suggested in case of layer 6, both these

predators might have been killed while poaching in the settlement. From this phase a mandible of small Indian civet (*Viverricula indica*), a cat-like Schedule II animal at present, was recovered. This omnivorous and nocturnal species prefers open bushy forests with tall grass. Though it feeds on small rodents and lizards, quite often poaches upon poultry birds. It is likely that this animal at Madina was such an accidental poacher that was killed and consumed.

The non-mammalian remains from this phase include the peafowl (*Pavo cristatus*), Ganges soft shell turtle (*Trionyx gangeticus*) Indian mud turtle (*Lissemys punctata*), and *Pila globosa*. An interesting find of this phase is fragment of marine shell of *Turbinella pyrum*.

## 8 MATERIAL FROM PITS

From several pits a total of 325 skeletal elements were recovered of which only 258 could be identified. Apart from the species found in the material from layers, two species were found only from the pits. These were the ass (*Equus asinus*) and the four-horned antelope (*Tetracerus quadricornis*). Only one mandibular premolar (M301) of the ass was found from the pit in trench C1 II (Unit 30). Similarly, the four-horned antelope has been represented by a single mandible fragment (M241) recovered from the pit in trench C1 I (Unit 35).

Bones of rodents get mixed with the archaeofaunal material since their mode of living, by digging burrows inside soil, disrupts the layers of ancient habitations. After their death, the bones of rodents may get incorporated along with the ancient bones, a commonly observed event in other sites too. But it should not be assumed always that the rodent bones are invariably of later periods. They could belong to the same time period as the other bones. This aspect is studied and taken into consideration as part of the natural and cultural factors which affect the site for-

mation processes. However, the three fragments of the bandicoot rat recovered from the pit in trench B1 II were later intrusions.

## 9 METRICAL ANALYSIS

Recording bone measurements is an essential part of archaeozoological methodology as the measurements can be used to look for the sizes of past animals, particularly the domestic ones. With the estimates of the size and height of the animals at the withers, it is possible to compare the domestic stocks at various archaeological sites and in different cultural periods (Joglekar 2000-2001). All the measurements were recorded in mm using a digital calliper with a least count of 0.01 mm (Tables 50 - 83).

It has been possible to estimate the height of the cattle at the withers using the medial length of the astragalus (Zalkin 1970). The estimate of the height of cattle found at Madina are 107.92 cm (M171), 109.56 (M409), 117.10 cm (M001) and 118.4 (M141). At present it is not possible to comment on the size profile of cattle at Madina since only four estimates are available, but, these could be used further for comparative purposes. Four such estimates are also available for the PGW culture site of Chak86 (Deshpande-Mukherjee *et al.* 2008). There are 104.37, 111.51, 111.42 and 118.67 cm. All these measurements show that the cattle sizes at Madina and Chak86 are comparable. Six estimates of the cattle height are available for cattle in PGW cultural phase at Alamgirpur (Joglekar 2009, unpublished report). A few cattle at Alamgirpur were of taller variety than at Madina and Chak86, however, Kruskal-Wallis H Test ( $H = 0.6285$ ) indicates that all the observations from the three sites could be considered as part of the same general population of cattle.



## 10 CONCLUDING REMARKS

One of the main purposes of studying the entire faunal material exhaustively was to get a picture of the faunal diversity during the PGW culture. The observed faunal diversity could be compared well with that reported in case of a few PGW sites in North India (Table 49). In all 30 species (10 domestic and 20 other types) have been found associated with the PGW culture. Simple diversity indices calculations show that lowest diversity has been observed at Chak86 (0.16) and highest at Madina (0.93). At the former site, no wild animal bones were recovered.

Cattle, buffalo, sheep and goats seem to be the most common domestic animals. These perhaps accounted for a majority of the food animals utilized in the PGW culture sites in North India. The people of PGW culture were engaged in occasional/ opportunistic hunting as well as have used aquatic fauna available to them. Presence of leopard and fox, two poachers at Madina and Atranjikhhera represents such opportunistic hunting. These two predators might have entered the settlements to prey upon livestock and eventually got killed.

The study of entire faunal material revealed that the people of Madina during the PGW cultural phase were primarily engaged in animal husbandry. Their main domestic animal used for food and perhaps for other products were cattle, sheep and goats. They kept a few buffaloes. The inhabitants of Madina hunted/ trapped wild animals in their vicinity in order to supplement their meat dietary needs.

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Table 49 Animal species identified at other PGW sites

Site	HST	RPR	BPR	AJK	Chak86	Madina
Cattle	+	+	+	+	+	+
Buffalo	+	+	+	+	+	+
Sheep	+	+	+	+	-	+
Goat	-	+	+	+	+	+
Pig	+	+	+	+	-	+
Horse	+	+	+	+	-	+
Ass	-	+	+	-	+	+
Dog	-	-	+	+	-	+
Cat	-	-	-	-	-	+
Domestic fowl	-	+	-	+	-	-
Nilgai	-	-	-	+	-	+
Blackbuck	-	-	-	-	-	+
Gazelle	-	-	-	-	-	+
Four horned antelope	-	-	-	-	-	+
Spotted deer	-	+	+	-	-	+
Barasingha/ Sambar	-	-	-	+	-	+
Hare	-	-	-	-	-	+
Wild pig	-	-	-	-	-	+
Civet cat	-	-	-	-	-	+
Leopard	-	-	-	+	-	+
Fox	-	-	-	-	-	+
Rhinoceros	-	-	-	-	-	+
Bandicoot	-	-	-	-	-	+
Peafowl	-	-	-	-	-	+
<i>L. punctata</i>	-	-	+	+	-	+
<i>T. gangeticus</i>	-	-	-	+	-	+
<i>C. indica</i>	-	-	-	+	-	-
<i>V. flavescens</i>	-	-	-	+	-	-
<i>Pila globosa</i>	-	-	-	-	-	+
<i>Turbinella pyrum</i>	-	-	-	-	-	+
<i>Lamellidens sp.</i>	-	-	-	-	-	+

HST: Hastinapura (Nath 1954-55)

RPR: Rupar (Nath 1968)

BPR: Bhagwanpura (Sharma 1993)

AJK: Atranjikhera (Shah 1983)

Chak86: (Deshpande-Mukherjee et al. 2008)

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Table 50 Measurements of humerus bones from Madina

Reg. No.	Trench	Layer	Bp	Bd	1	7	Species
M267	B1 I	2	--	--	76.26	--	<i>Bos indicus</i>
M268	B1 I	2	--	--	71.45	--	<i>Bos indicus</i>
M277	D1 III	2	93.65	--	--	--	<i>Bos indicus</i>
M375	ZD1 IV	2	--	88.88	--	81.59	<i>Bos indicus</i>
M312	B1 II	U31	--	30.20	--	--	<i>Capra hircus</i>
M224	B1 III	2	--	30.61	--	--	<i>Capra hircus</i>
M58	C1 IV	2	--	23.30	--	--	<i>B. tragocamelus</i>

Bp: Maximum proximal width  
 Bd: Maximum distal width  
 7: Condylar width

Table 51 Measurements of radius bones from Madina

Reg. No.	Trench	Layer	Gl	Bp	Tp	Bd	Td	Species
M238	B1 II	2	--	75.9	37.76	--	--	<i>Bos indicus</i>
M247	D1 I	2	--	74.68	37.78	--	--	<i>Bos indicus</i>
M274	B1 I	2	306.66	77.64	37.64	71.33	50.7	<i>Bos indicus</i>
M275	D1 III	2	--	84.66	41.09	--	--	<i>Bos indicus</i>
M404	B1 IV	2	--	--	--	62.69	46.34	<i>Bos indicus</i>
M416	B1 IV	2	--	77.76	--	--	--	<i>Bos indicus</i>
M408	B1 IV	2	--	91.35	--	--	--	<i>Bubalus bubalis</i>
M54	C1 IV	2	--	--	--	54.44	--	<i>Capra /Ovis</i>
M154	C1	3	--	--	--	68.00	46.00	<i>Bos indicus</i>
M186	C1	3	--	--	--	70.00	50.15	<i>Bos indicus</i>
M173	D1	3	--	--	--	25.28	15.68	<i>Capra hircus</i>
M377	C1 II	U33	--	--	--	64.46	44.82	<i>Bos indicus</i>

GL: Maximum length  
 Bp: Maximum proximal width  
 Tp: Proximal thickness  
 Bd: Maximum distal width  
 Td: Maximum distal thickness

Table 52 Measurements of femur bones from Madina

Reg. No.	Trench	Layer	Bp	Bd	6	Species
M308	B1 II	U31	--	--	47.90	<i>Bos indicus</i>
M410	B1 IV	2	--	27.33	--	<i>A cervicapra</i>
M215	D2	2	--	--	41.89	<i>Bos indicus</i>
M244	D1 I	2	--	--	44.66	<i>Bos indicus</i>
M245	D1 I	2	--	--	44.92	<i>Bos indicus</i>
M285	D1 III	2	99.00	--	--	<i>Bos indicus</i>
M56	C1 IV	2	39.69	--	20.08	<i>Canis familiaris</i>
M113	D1	8	--	--	43.77	<i>Bos indicus</i>

Bp: Maximum proximal width  
 Bd: Maximum distal width



## Excavations at Madina

Table 53 Measurements of tibia bones from Madina

Reg. No.	Trench	Layer	Bp	Tp	Bd	Td	Species
M430	C1 III	1	--	--	66.62	49.14	<i>Bos indicus</i>
M230	B1 II	2	--	--	23.54	19.22	<i>A. cervicapra</i>
M293	D1 II	2	--	--	--	--	<i>Bos/Bubalus</i>
M257	D1 I	2	--	--	57.38	41.67	<i>Bos indicus</i>
M270	B1 I	2	--	--	67.13	--	<i>Bos indicus</i>
M432	C1 III	2	--	--	64.59	46.56	<i>Bos indicus</i>
M433	C1 III	2	--	--	53.90	41.18	<i>Bos indicus</i>
M2	D1 IV	3	--	--	24.00	19.68	<i>A.cervicapra</i>
M142	ZD1	5	--	--	56.30	40.28	<i>Bos indicus</i>
M314	B1 II	U31	93.63	--	--	--	<i>Bos indicus</i>
M309	B1 II	U31	66.12	46.48	--	--	<i>Bubalus bubalis</i>

Bp: Maximum proximal width

Tp: Proximal thickness

Bd: Maximum distal width

Td: Maximum distal thickness

Table 54 Madina: measurements of first phalanges

Reg. No.	Trench	Layer	Gl	GLL	Bp	Tp	Bd	Species
M288	D1 I	1	59.03	--	24.69	30.13	24.65	<i>B.tragocamelus</i>
M209	D2 II	2	--	75.49	34.70	32.80	33.10	<i>Bos indicus</i>
M222	B1 III	2	--	72.17	31.61	37.22	31.56	<i>Bos indicus</i>
M225	B1 III	2	--	--	--	--	25.23	<i>Bos indicus</i>
236	B1 II	2	--	61.94	26.29	30.87	25.91	<i>Bos indicus</i>
M258	D1 I	2	63.60	--	24.20	30.38	23.32	<i>Bos indicus</i>
M261	D1 I	2	--	54.80	--	--	24.82	<i>Bos indicus</i>
M259	D1 I	2	--	52.90	24.70	26.71	25.30	<i>Bos indicus</i>
M260	D1 I	2	--	65.55	25.81	30.08	25.28	<i>Bos indicus</i>
M266	B1 I	2	61.84	--	29.68	--	--	<i>Bos indicus</i>
M276	D1 III	2	70.08	--	32.06	30.09	28.57	<i>Bos indicus</i>
M279	D1 III	2	--	58.00	--	--	--	<i>Bos indicus</i>
M340	C1 IV	2	--	--	--	--	17.00	<i>Bos indicus</i>
M343	ZD1 IV	2	36.39	--	17.26	18.59	16.26	<i>Bos indicus</i>
M401	B1 IV	2	63.61	--	28.55	34.71	27.16	<i>Bos indicus</i>
M402	B1 IV	2	65.38	--	32.44	34.42	28.79	<i>Bos indicus</i>
M411	B1 IV	2	63.85	--	31.92	33.15	--	<i>Bos indicus</i>
M438	C1 III	2	54.35	--	27.93	31.92	25.74	<i>Bos indicus</i>
M41	C1 II	2	--	57.95	28.36	31.53	26.07	<i>Bos indicus</i>
M20	B1 III	2	--	58.38	27.70	29.55	25.62	<i>Bubalus bubalis</i>
M427	B1 IV	2	--	33.46	10.36	12.85	9.41	<i>Gazella bennetti</i>
M428	B1 IV	2	--	35.79	12.81	13.78	11.37	<i>Gazella bennetti</i>
M150	C1	3	61.25	--	34.33	--	31.23	<i>Bos indicus</i>
M151	C1	3	--	63.43	31.44	32.00	--	<i>Bos indicus</i>
M156	C1	3	--	--	--	--	25.14	<i>Bos indicus</i>
M164	B1	3	--	--	--	--	10.12	<i>Bos indicus</i>
M174	D1	3	--	--	--	--	28.87	<i>Bos indicus</i>
M181	D1	3	60.67	--	27.32	--	27.78	<i>Bos indicus</i>
M187	C1	3	--	60.74	27.38	--	26.95	<i>Bos indicus</i>
M195	C1	3	--	--	--	--	16.60	<i>Bos indicus</i>
M9	D1 IV	3	--	57.22	26.40	31.35	24.35	<i>Bos indicus</i>

GL: Maximum length; GLL: Lateral length; Bp: Maximum proximal width; Tp: Proximal thickness

Bd: Maximum distal width

Table 55 Madina: measurements of first phalanges

Reg. No.	Trench	Layer	Gl	GLI	Bp	Tp	Bd	Species
M172	D <sub>3</sub>	3	--	57.73	28.22	28.71	26.35	<i>Capra hircus</i>
M123	D <sub>1</sub>	6	58.23	--	25.70	28.73		<i>Bos indicus</i>
M310	B <sub>1</sub> II	U <sub>31</sub>	--	66.89	34.59	32.79	29.73	<i>Bos indicus</i>
M311	B <sub>1</sub> II	U <sub>31</sub>	--	62.30	30.48	32.14	27.33	<i>Bos indicus</i>
M334	B <sub>1</sub> II	U <sub>32</sub>	67.52	--	27.84	--	25.80	<i>Bos indicus</i>
M339	B <sub>2</sub> II	U <sub>32</sub>	57.85	--	26.83	27.07	24.21	<i>Bos indicus</i>
M387	C <sub>1</sub> II	U <sub>33</sub>	56.89	--	28.48	25.23	24.90	<i>Bos indicus</i>
M382	C <sub>1</sub> II	U <sub>33</sub>	48.82	--	--	--	20.83	<i>Bos indicus</i>
M381	C <sub>1</sub> II	U <sub>33</sub>	64.26	--	18.40	25.24	18.65	<i>B. tragocamelus</i>
M380	C <sub>1</sub> II	U <sub>33</sub>	65.86	--	32.07	39.25	31.99	<i>Bubalus Bubalis</i>
M388	C <sub>1</sub> II	U <sub>33</sub>	37.65	--	11.81	12.35	9.32	<i>Capra hircus</i>
M240	C <sub>1</sub> I	U <sub>35</sub>	66.04	--	27.65	33.35	26.25	<i>Bos indicus</i>

Table 56 Madina: measurements of second phalanges

Reg. No.	Trench	Layer	Gl	GLI	Bp	Tp	Bd	Species
M315	B <sub>1</sub> II	1	46.23	--	31.03	31.12	29.64	<i>Bubalus bubalis</i>
M218	B <sub>1</sub> III	2	42.06	--	25.90	28.10	22.34	<i>Bos indicus</i>
M233	B <sub>1</sub> II	2	--	38.72	24.50	29.42	21.38	<i>Bos indicus</i>
M280	D <sub>1</sub> III	2	--	43.13	25.24	30.19	22.27	<i>Bos indicus</i>
M344	ZD <sub>1</sub> IV	2	39.97	--	25.77	28.81	20.79	<i>Bos indicus</i>
M345	ZD <sub>1</sub> IV	2	--	30.15	--	--	18.90	<i>Bos indicus</i>
M346	ZD <sub>1</sub> IV	2	43.50	--	27.24	31.41	23.83	<i>Bos indicus</i>
M327	D <sub>2</sub> I	2	--	38.00	--	--	25.06	<i>Bubalus bubalis</i>
M437	C <sub>1</sub> III	2	47.44	--	31.59	34.19	26.59	<i>Bubalus bubalis</i>
M27	B <sub>1</sub> III	2	43.00	--	28.10	28.41	24.87	<i>Bubalus bubalis</i>
M28	B <sub>1</sub> III	2	44.50	--	28.75	29.00	25.11	<i>Bubalus bubalis</i>
M159	C <sub>1</sub>	3	--	45.00	27.00	32.74	22.81	<i>Bos indicus</i>
M114	D <sub>1</sub>	7	--	39.25	25.26	26.38	22.35	<i>Bos indicus</i>
M385	C <sub>1</sub> II	U <sub>33</sub>	46.04	--	24.15	31.99	16.93	<i>B. tragocamelus</i>
M383	C <sub>1</sub> II	U <sub>33</sub>	44.28	--	28.13	32.87	23.67	<i>Bubalus bubalis</i>
M242	C <sub>1</sub>	U <sub>35</sub>	48.83	--	34.17	37.52	--	<i>Bubalus bubalis</i>

Table 57 Madina: measurements of third phalanges

Reg. No.	Trench	Layer	Maximum length	Dorsal length	Width of the articular surface	Species
M239	B <sub>1</sub> II	2	--	--	26.60	<i>Bos indicus</i>
M256	D <sub>1</sub> I	2	--	--	22.05	<i>Bos indicus</i>
M298	ZD <sub>1</sub> III	2	64.88	51.83	21.52	<i>Bos indicus</i>
M133	ZD <sub>1</sub>	6	--	--	26.37	<i>Bos indicus</i>
M120	D <sub>1</sub>	7	--	--	21.00	<i>Bos indicus</i>
M386	C <sub>1</sub> II	U <sub>33</sub>	56.25	45.60	20.51	<i>Bos indicus</i>
M384	C <sub>1</sub> II	U <sub>33</sub>	60.85	49.72	23.17	<i>B. bubalis</i>

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Table 58 Madina: measurements of astragalus bones

Reg. No.	Trench	Layer	GLl	GLm	Bd	Td	Dd	Species
M33	D1 I	1	--	--	39.36	--	--	<i>Bos indicus</i>
M409	B1 IV	2	--	60.42	38.07	33.68	29.56	<i>Bos indicus</i>
M254	D1 I	2	64.40	--	44.00	--	--	<i>Bubalus bubalis</i>
M171	D3	3	64.73	59.60	38.54	32.20	28.90	<i>Bos indicus</i>
M1	ZD1 IV	4	67.90	64.00	44.14	34.33	32.43	<i>Bos indicus</i>
M141	ZD1	5	72.65	65.43	39.15	34.76	30.37	<i>Bos indicus</i>
M140	ZD1	5	66.90	61.95	40.95	34.70	31.15	<i>Bubalus bubalis</i>

GLl: Lateral length  
 GLm: Medial length  
 Bd: Maximum distal width  
 Lth: Thickness of lateral portion  
 Mth: Thickness of medial portion

Table 59 Madina: measurements of calcaneum and centrotarsal bones

Reg. No.	Bone	Trench	Layer	Max length	Max width	Max height	Species
M325	CA	D2 I	2	--	39.65	49.03	<i>Bos indicus</i>
M157	CA	C1	3	128.12	40.34	51.07	<i>Bos indicus</i>
M122	CA	D1	6	--	36.26	48.23	<i>Bos indicus</i>
M32	CT	D1 I	1	--	50.60	--	<i>Bubalus bubalis</i>
M273	CT	B1 I	2	--	59.75	--	<i>Bos indicus</i>
M53	CT	C1 IV	2	--	58.41	--	<i>Bubalus bubalis</i>
M291	CT	D1 II	2	--	60.73	--	<i>Bubalus bubalis</i>
M248	CT	D1 I	2	--	52.36	--	<i>Bubalus bubalis</i>
M124	CT	D1	6	--	50.00	--	<i>Bos indicus</i>
M336	CT	B1 II	U32	--	47.65	--	<i>B.tragocamelus</i>

Table 60 Madina: measurements of metacarpals

Reg. No.	Trench	Layer	GL	Bp	Tp	Bd	Td	Species
M35	D1 I	1	--	--	--	26.05	12.43	<i>Ovis aries</i>
M219	B1 III	2	--	--	--	51.45	26.23	<i>Bos indicus</i>
M434	C1 III	2	--	--	--	49.85	26.97	<i>Bos indicus</i>
M436	C1 III	2	--	--	--	53.33	29.01	<i>Bos indicus</i>
M403	B1 IV	2	--	57.92	--	--	--	<i>Bubalus bubalis</i>
M163	B1	3	--	--	15.00	--	--	<i>A.cervicapra</i>
M182	C1	3	--	50.70	31.00	--	--	<i>Bos indicus</i>
M111	D1	7	--	--	33.00	--	--	<i>Bos indicus</i>
M100	D1	9	--	--	--	20.00	11.65	<i>Gazella bennetti</i>
M338	B2 II	U32	222	55.33	32.69	--	--	<i>Bos indicus</i>

GL: Maximum length  
 Bp: Maximum proximal width  
 Tp: Proximal thickness  
 Bd: Maximum distal width  
 Td: Maximum distal thickness



Table 61 Madina: measurements of metatarsals

Reg. No.	Trench	Layer	Bp	Tp	Bd	Td	Species
M36	D1 I	1	38.44	39.15	--	--	<i>Bos indicus</i>
M406	B1 IV	2	--	--	24.58	16.00	<i>A. cervicapra</i>
M43	C1 II	2	18.50	20.75	--	--	<i>B.tragocamelus</i>
M284	D1 III	2	45.56	44.29	--	--	<i>Bos indicus</i>
M286	D1 III	2	--	--	53.05	31.74	<i>Bos indicus</i>
M287	D1 III	2	--	--	55.57	29.32	<i>Bos indicus</i>
M184	C1	3	43.48	39.15	-	--	<i>Bos indicus</i>
M185	C1	3	42.43	40.30	--	--	<i>Bos indicus</i>
M187	C1	3	53.10	47.24	--	--	<i>Bubalus bubalis</i>
M132	Zd1	6	45.66	41.95	--	--	<i>Bos indicus</i>
M110	D1	7	45.00	45.63	--	--	<i>Bos indicus</i>
M379	C1 II	U33	--	--	46.15	26.64	<i>Bos indicus</i>
M378	C1 II	U33	--	--	59.65	36.42	<i>Bubalus bubalis</i>

Table 62 Measurements of *Bos indicus* maxillae from Madina

Reg. No.		M290	M55	M52	M447	M445	M358
Trench		D1 I	C1	C1	CI II	CI II	ZD1 I
Layer/Unit		1	2	2	2	2	2
P2	Length	--	--	--	--	15.22	--
	Width	--	--	--	--	11.80	--
P3	Length	--	--	--	--	16.39	--
	Width	--	--	--	--	15.13	--
P4	Length	--	--	--	--	17.30	--
	Width	--	--	--	--	18.18	22.45
M1	Length	--	--	--	23.28	--	14.27
	Width	--	--	--	14.27	--	25.06
M2	Length	21.20	29.84	24.39	--	--	14.64
	Width	24.24	15.77	13.51	--	--	29.60
M3	Length	--	--	--	--	--	13.56
	Width	--	--	--	--	--	--

Table 63 Measurements of *Bos indicus* maxillae from Madina

Reg. No.		M65	M341	M199	Mo05	Mo13	M320
Trench		C1	C1 IV	C1	D1	D1	B1 II
Layer/Unit		2	2	3	3	3	U31
P2	Length	17.06	--	--	13.13	--	--
	Width	19.34	--	--	9.71	--	--
P3	Length	--	--	--	20.00	--	24.44
	Width	--	--	--	13.53	--	13.80
P4	Length	--	--	15.90	--	--	--
	Width	--	--	12.70	--	--	--
M1	Length	--	18.89	--	--	19.82*	--
	Width	--	19.20	--	--	14.12	--
M2	Length	--	28.50	--	--	25.18**	--
	Width	--	18.91	--	--	15.12	--
M3	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--

\* dM1

\*\* dM2

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Table 64 Measurements of maxillae from Madina

<i>Reg. No.</i>		M125	M126	M108	M109	M015
<i>Trench</i>		D1	D1	D1	D1	D1
<i>Layer/Unit</i>		6	6	7	7	3
<i>Species</i>		<i>B. indicus</i>	<i>B. indicus</i>	<i>B. indicus</i>	<i>B. indicus</i>	<i>B. bubalis</i>
P <sub>2</sub>	Length	--	13.57	--	--	--
	Width	--	21.40	--	--	--
P <sub>3</sub>	Length	--	14.65	--	11.84	--
	Width	--	15.20	--	10.40	--
P <sub>4</sub>	Length	--	--	--	19.47	--
	Width	--	--	--	17.20	--
M <sub>1</sub>	Length	--	--	--	20.78	25.06
	Width	22.39	--	--	19.42	12.65
M <sub>2</sub>	Length	21.00	--	--	24.70	25.28
	Width	26.72	--	--	17.42	15.67
M <sub>3</sub>	Length	23.40	--	29.00	25.00	23.23
	Width	--	--	25.00	12.82	19.16

Table 65 Measurements of maxillae from Madina

<i>Reg. No.</i>		M008	M399	M306	M307
<i>Trench</i>		D1	CI II	D1 IV	D1 IV
<i>Layer/Unit</i>		3	U33	2	2
<i>Species</i>		<i>Axis axis</i>	<i>Axis axis</i>	<i>A. cervicapra</i>	<i>A. cervicapra</i>
P <sub>2</sub>	Length	--	--	--	7.14
	Width	--	--	--	8.14
P <sub>3</sub>	Length	--	--	--	8.18
	Width	--	--	--	9.79
P <sub>4</sub>	Length	--	--	--	--
	Width	--	--	--	--
M <sub>1</sub>	Length	22.84	--	14.21	--
	Width	12.26	--	12.23	--
M <sub>2</sub>	Length	--	--	--	--
	Width	--	--	--	--
M <sub>3</sub>	Length	--	21.58	--	--
	Width	--	12.70	--	--

Table 66 Measurements of *Capra/Ovis* maxillae from Madina

<i>Reg. No.</i>		M211	M29	M106	M265	M148
<i>Trench</i>		D2 II	B1	D1	D1 I	C1
<i>Layer/Unit</i>		2	3	7	2	3
<i>Species</i>		<i>O. aries</i>	<i>O. aries</i>	<i>O. aries</i>	<i>C. hircus</i>	<i>C. hircus</i>
P <sub>2</sub>	Length	--	--	6.96	--	--
	Width	--	--	7.71	--	--
P <sub>3</sub>	Length	7.17	8.13	10.67	--	--
	Width	7.50	8.46	7.20	--	--
P <sub>4</sub>	Length	10.41	9.92	10.40	--	--
	Width	11.46	10.26	7.77	--	--
M <sub>1</sub>	Length	15.19	--	14.33	18.03	--
	Width	12.88	--	12.93	11.02	--
M <sub>2</sub>	Length	--	--	--	--	15.74
	Width	--	--	--	--	11.02
M <sub>3</sub>	Length	--	--	--	--	15.90
	Width	--	--	--	--	8.84

Table 67 Measurements of *Capra/Ovis* maxillae from Madina

Reg. No.		M213	M232	M367	M362
Trench		D2 II	B1 II	ZD1 I	ZD1 I
Layer/Unit		2	2	2	2
Species		<i>Capra/Ovis</i>	<i>Capra/Ovis</i>	<i>Capra/Ovis</i>	<i>Capra/Ovis</i>
P2	Length	--	--	--	--
	Width	--	--	--	--
P3	Length	7.44	--	--	--
	Width	9.08	--	--	--
P4	Length	--	--	--	--
	Width	--	--	--	--
M1	Length	--	15.73	--	--
	Width	--	12.71	--	--
M2	Length	--	--	--	17.92
	Width	--	--	--	11.38
M3	Length	--	--	16.84	--
	Width	--	--	8.50	--

Table 68 Measurements of maxillae from Madina

Reg. No.		M368	M369	M370	M324
Trench		ZD1 I	ZD1 I	ZD1 I	B1 II
Layer/Unit		2	2	2	U31
Species		<i>Capra/Ovis</i>	<i>Capra/Ovis</i>	<i>Capra/Ovis</i>	<i>C. unicolor</i>
P2	Length	--	--	--	--
	Width	--	--	--	--
P3	Length	--	--	--	--
	Width	--	--	--	--
P4	Length	--	--	10.11	--
	Width	--	--	13.55	--
M1	Length	--	--	12.22	--
	Width	--	--	8.52	--
M2	Length	16.73	14.47	--	20.66
	Width	11.94	10.58	--	13.73
M3	Length	--	--	--	--
	Width	--	--	--	--
Condyle width					

Table 69 Madina: Measurements of *Bos indicus* mandibles

Reg. No.		M031	M289	M292	M253	M331	M333	M342
Trench		D1 I	D1 I	D1 I	D1 I	D2 I	D2 I	ZD1 I
Layer/Unit		1	1	1	2	2	2	2
P2	Length	--	--	--	--	--	--	--
	Width	--	--	--	--	--	--	--
P3	Length	--	--	19.68	--	--	--	--
	Width	--	--	8.81	--	--	--	--
P4	Length	--	--	21.28	31.04*	--	--	--
	Width	--	--	10.76	11.05	--	--	--
M1	Length	8.11	24.64	--	--	--	--	--
	Width	5.04	14.80	--	--	--	--	--
M2	Length	16.30	--	--	--	25.50	26.53	--
	Width	8.06	--	--	--	15.60	11.20	--
M3	Length	32.40	--	--	--	--	--	--
	Width	9.92	--	--	--	--	--	--
Condyle width		--	--	--	--	--	--	24.76



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Table 70 Madina: Measurements of *Bos indicus* mandibles

Reg. No.		M355	M443	M415	M440	M441
Trench		ZD1 I	CI II	BI IV	CI II	CI II
Layer/Unit		2	2	2	2	2
P2	Length	--	--	--	--	--
	Width	--	--	--	--	--
P3	Length	--	18.91*	--	--	--
	Width	--	5.90	--	--	--
P4	Length	--	27.57*	--	--	--
	Width	--	10.89	--	--	--
M1	Length	--	24.60	--	--	--
	Width	--	11.92	--	--	--
M2	Length	29.28	--	24.69	28.04	23.62
	Width	11.60	--	11.74	9.92	15.11
M3	Length	--	--	35.35	--	--
	Width	--	--	14.37	--	--
Condyle width		--	--	--	--	--

Table 71 Madina: Measurements of *Bos indicus* mandibles

Reg. No.		M444	M446	M190	M191	M192	M193
Trench		CI II	CI II	C1	C1	C1	C1
Layer/Unit		2	2	2	2	2	3
P2	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
P3	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
P4	Length	19.64	--	--	--	--	--
	Width	12.82	--	--	--	--	--
M1	Length	22.06	--	--	--	--	--
	Width	16.07	--	--	--	--	--
M2	Length	--	29.68	--	31.70	--	--
	Width	--	9.75	--	11.63	--	--
M3	Length	--	--	35.30	--	--	--
	Width	--	--	12.30	--	--	--
Condyle width		--	--	39.00	39.90	28.70	38.80

Table 72 Madina: Measurements of mandibles

Reg. No.		M197	M146	M129	M394	M326
Trench		C1	C1	ZD1	CI II	D2 I
Layer/Unit		3	4	6	33	2
Species		<i>B. indicus</i>	<i>B. indicus</i>	<i>B. indicus</i>	<i>B. indicus</i>	<i>B. bubalis</i>
P2	Length	7.68	--	--	--	--
	Width	6.45	--	--	--	--
P3	Length	--	--	--	--	--
	Width	--	--	--	--	--
P4	Length	--	31.40*	--	--	--
	Width	--	10.50	--	--	--
M1	Length	--	--	27.50	--	--
	Width	--	--	14.82	--	--
M2	Length	--	--	--	33.25	--
	Width	--	--	--	16.83	--
M3	Length	--	--	--	--	--
	Width	--	--	--	--	--
Condyle width		--	--	--	--	39.10

Table 73 Madina: Measurements of *Ovis aries* mandibles

Reg. No.		M255	M347	M351	M352	M112	M119
Trench		D1 I	ZD1 I	ZD1 I	ZD1 I	D1	D1
Layer/Unit		2	2	2	2	7	7
P2	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
P3	Length	--	7.93*	--	--	7.27	--
	Width	--	5.03	--	--	4.54	--
P4	Length	8.64	13.51*	16.29*	15.35*	9.90	--
	Width	5.64	5.59	6.17	6.17	5.85	--
M1	Length	14.21	12.13	14.47	--	15.36	--
	Width	7.64	6.94	7.33	--	7.37	--
M2	Length	16.23	15.94	14.40	--	18.00	--
	Width	7.75	6.00	6.79	--	8.90	--
M3	Length	--	--	--	--	19.05	--
	Width	--	--	--	--	6.15	--
Condyle width		--	--	--	--	--	19.05

Table 74 Madina: Measurements of *Capra hircus* mandibles

Reg. No.		M249	M439	M42	M166	M243
Trench		D1 I	CI I	C1	D1	C1 I
Layer/Unit		2	2	2	3	U35
		<i>C. hircus</i>	<i>C. hircus</i>	<i>C. hircus</i>	<i>C. hircus</i>	<i>C. hircus</i>
P2	Length	--	--	--	--	--
	Width	--	--	--	--	--
P3	Length	--	8.31	9.36*	8.00	--
	Width	--	4.52	5.39	5.34	--
P4	Length	13.63*	10.26	20.27*	10.25	--
	Width	6.50	6.34	6.80	6.33	--
M1	Length	13.33	11.15	--	11.40	--
	Width	8.73	7.96	--	8.68	--
M2	Length	18.07	14.68	--	14.71	--
	Width	8.48	8.40	--	9.45	--
M3	Length	--	--	--	--	--
	Width	--	--	--	--	--
Condyle width		--	--	--	--	24.60

Table 75 Madina: Measurements of *Capra/Ovis* mandibles

Reg. No.		M234	M226	M217	M442	M210
Trench		B1 II	B1 II	B1 II	CI II	D2 II
Layer/Unit		2	2	2	2	2
P2	Length	--	--	--	3.77*	6.33
	Width	--	--	--	3.31	2.98
P3	Length	--	9.39*	9.67*	6.90*	7.45
	Width	--	4.68	4.87	4.19	--
P4	Length	--	15.34*	16.22*	14.79*	9.93
	Width	--	5.34	6.36	6.78	6.15
M1	Length	--	--	--	13.54	14.45
	Width	--	--	--	7.22	8.67
M2	Length	16.88	--	--	--	15.80
	Width	6.72	--	--	--	8.38
M3	Length	--	--	--	--	13.80
	Width	--	--	--	--	6.22
Condyle width		--	--	--	--	--

## Excavations at Madina

Table 76 Madina: Measurements of *Capra/Ovis* mandibles

Reg. No.		M372	M364	M330	M282	M235
Trench		ZD1 I	ZD1 I	D2 I	D1 II	B1 II
Layer/Unit		2	2	2	2	2
P2	Length	--	--	--	--	--
	Width	--	--	--	--	--
P3	Length	--	--	--	7.75*	--
	Width	--	--	--	4.80	--
P4	Length	19.36*	19.49*	--	14.43*	--
	Width	4.68	5.40	--	6.34	--
M1	Length	--	--	--	--	--
	Width	--	--	--	--	--
M2	Length	--	--	--	--	16.40
	Width	--	--	--	--	6.24
M3	Length	--	--	22.10	--	--
	Width	--	--	8.63	--	--
Condyle width		--	--	--	--	--

Table 77 Madina: Measurements of *Capra/Ovis* mandibles

Reg. No.		M51	M196	M194	M103	M321	M322
Trench		C1	C1	C1	D1	B1 II	B1 II
Layer/Unit		2	3	3	8	31	31
P2	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
P3	Length	--	4.70	--	--	--	--
	Width	--	4.60	--	--	--	--
P4	Length	15.50*	--	--	--	19.00*	17.95*
	Width	6.48	--	--	--	6.42	6.12
M1	Length	13.67	13.30	--	17.84	--	--
	Width	6.66	7.40	--	10.95	--	--
M2	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
M3	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
Condyle width		--	--	15.24	--	--	--

Table 78 Madina: Measurements of mandibles

Reg. No.		M034	M237	M264	M305
Trench		D1 I	B1 II	D1 I	D1 IV
Layer/Unit		1	2	2	2
Species		<i>B. tragocamelus</i>	<i>A. cervicapra</i>	<i>A. cervicapra</i>	<i>A. cervicapra</i>
P2	Length	10.08	--	--	--
	Width	8.07	--	--	--
P3	Length	15.65	--	--	--
	Width	10.32	--	--	--
P4	Length	19.05	15.41*	--	--
	Width	11.47	5.70	--	--
M1	Length	--	13.94	--	--
	Width	--	7.05	--	--
M2	Length	--	--	--	--
	Width	--	--	--	--
M3	Length	--	--	--	23.50
	Width	--	--	--	9.82
Condyle width		--	--	20.93	--



Table 79 Madina: Measurements of *A. cervicapra* mandibles

Reg. No.		M349	M350	M353	M413	M414	M421
Trench		ZD1 I	ZD1 I	ZD1 I	BI IV	BI IV	BI IV
Layer/Unit		2	2	2	2	2	2
P2	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
P3	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
P4	Length	--	--	--	9.61	--	--
	Width	--	--	--	7.39	--	--
M1	Length	--	--	--	11.30	14.56	--
	Width	--	--	--	7.74	8.94	--
M2	Length	--	--	13.31	14.88	--	--
	Width	--	--	7.67	9.18	--	--
M3	Length	--	--	19.69	24.07	--	--
	Width	--	--	7.47	9.00	--	--
Condyle width		15.58	16.85	--	--	--	23.49

Table 80 Madina: Measurements of mandibles

Reg. No.		M296	M143	M396	M328	M356
Trench		D1 II	C1	C1 II	D2	ZD1 I
Layer/Unit		2	4	33	2	2
Species		<i>A. cervicapra</i>	<i>A. cervicapra</i>	<i>A. cervicapra</i>	<i>G. bennetti</i>	<i>G. bennetti</i>
P2	Length	--	--	--	--	--
	Width	--	--	--	--	--
P3	Length	--	--	--	--	--
	Width	--	--	--	--	--
P4	Length	--	--	--	--	9.12*
	Width	--	--	--	--	3.84
M1	Length	--	--	--	--	10.42
	Width	--	--	--	--	5.28
M2	Length	--	--	13.98	--	13.09
	Width	--	--	7.77	--	4.96
M3	Length	25.03	11.31	--	--	--
	Width	10.18	6.63	--	--	--
Condyle width		--	--	--	15.03	--

Table 81 Madina: Measurements of mandibles

Reg. No.		M357	M198	M241
Trench		ZD1 I	C1	C1 I
Layer/Unit		2	3	35
Species		<i>G. bennetti</i>	<i>G. bennetti</i>	<i>T. quadricornis</i>
P2	Length	5.31	--	--
	Width	3.21	--	--
P3	Length	8.22	--	--
	Width	4.85	--	--
P4	Length	9.92	--	--
	Width	6.44	--	--
M1	Length	11.98	--	--
	Width	7.70	--	--
M2	Length	--	14.50	13.39
	Width	--	7.10	7.58
M3	Length	--	--	--
	Width	--	--	--

## Excavations at Madina

Table 82 Madina: Measurements of isolated maxillary teeth

Reg. No.	Trench	Layer	Species	Tooth	Length	Width
M <sub>31</sub>	D <sub>1</sub> I	1	<i>Bos indicus</i>	dP <sub>4</sub>	32.40	9.92
M <sub>38</sub>	D <sub>1</sub> I	1	<i>Bubalus bubalis</i>	M <sub>1</sub> /M <sub>2</sub>	31.66	15.55
M <sub>231</sub>	B <sub>1</sub> II	2	<i>Bos indicus</i>	P <sub>2</sub>	13.14	8.55
M <sub>263</sub>	D <sub>1</sub> I	2	<i>Bos indicus</i>	P <sub>4</sub>	20.32	12.00
M <sub>48</sub>	C <sub>1</sub> IV	2	<i>Bos indicus</i>	M <sub>2</sub>	30.72	23.66
M <sub>418</sub>	B <sub>1</sub> IV	2	<i>Bubalus bubalis</i>	M <sub>2</sub>	30.73	16.42
M <sub>363</sub>	ZD <sub>1</sub> IV	2	<i>Capra /Ovis</i>	M <sub>3</sub>	21.64	12.02
M <sub>297</sub>	ZD <sub>1</sub> III	2	<i>Capra hircus</i>	M <sub>3</sub>	15.75	8.80
M <sub>10</sub>	D <sub>1</sub> IV	3	<i>Bos indicus</i>	P <sub>4</sub>	16.82	14.08
M <sub>155</sub>	C <sub>1</sub>	3	<i>Bos indicus</i>	P <sub>2</sub>	14.1	21.55
M <sub>6</sub>	D <sub>1</sub> IV	3	<i>Bos indicus</i>	M <sub>2</sub>	27.51	14.52
M <sub>170</sub>	D <sub>1</sub>	3	<i>Bubalus bubalis</i>	M <sub>2</sub>	28.83	16.93
M <sub>152</sub>	C <sub>1</sub>	3	<i>Ovis aries</i>	M <sub>1</sub>	13.89	10.42
M <sub>144</sub>	C <sub>1</sub>	4	<i>Capra hircus</i>	M <sub>2</sub>	17.24	10.26
M <sub>138</sub>	ZD <sub>1</sub>	5	<i>Bubalus bubalis</i>	M <sub>2</sub>	30.20	17.53
M <sub>139</sub>	ZD <sub>1</sub>	5	<i>Cervus unicolor</i>	M <sub>2</sub>	24.20	17.00
M <sub>128</sub>	ZD <sub>1</sub>	6	<i>Bos indicus</i>	P <sub>3</sub>	16.80	17.90
M <sub>130</sub>	ZD <sub>1</sub>	6	<i>Bos indicus</i>	M <sub>2</sub>	26.50	16.56
M <sub>131</sub>	ZD <sub>1</sub>	6	<i>Bos indicus</i>	M <sub>2</sub>	30.74	11.28
M <sub>115</sub>	D <sub>1</sub>	7	<i>Bos indicus</i>	P <sub>2</sub>	17.83	13.08
M <sub>116</sub>	D <sub>1</sub>	7	<i>Bos indicus</i>	P <sub>4</sub>	16.43	17.04
M <sub>107</sub>	D <sub>1</sub>	7	<i>Capra hircus</i>	M <sub>2</sub>	12.97	12.40
M <sub>299</sub>	C <sub>1</sub> II	U <sub>30</sub>	<i>Bos indicus</i>	P <sub>4</sub>	15.43	21.60
M <sub>300</sub>	C <sub>1</sub> II	U <sub>30</sub>	<i>Bos indicus</i>	P <sub>3</sub>	15.56	14.11
M <sub>319</sub>	B <sub>1</sub> II	U <sub>31</sub>	<i>Bos indicus</i>	M <sub>2</sub>	28.13	23.64
M <sub>324</sub>	B <sub>1</sub> II	U <sub>31</sub>	<i>Cervus unicolor</i>	M <sub>2</sub>	20.66	13.73
M <sub>398</sub>	C <sub>1</sub> II	U <sub>33</sub>	<i>Bos indicus</i>	P <sub>2</sub>	15.81	13.40
M <sub>397</sub>	C <sub>1</sub> II	U <sub>33</sub>	<i>Capra hircus</i>	M <sub>3</sub>	16.55	8.65

Table 83 Madina: Measurements of isolated Mandibular teeth

Reg. No.	Trench	Layer	Species	Tooth	Length	Width
M <sub>291</sub>	D <sub>1</sub> I	1	<i>Bos /Bubalus</i>	dp <sub>4</sub>	29.02	12.12
M <sub>422</sub>	B <sub>1</sub> IV	2	<i>Antilope cervicapra</i>	m <sub>3</sub>	23.2	9.77
M <sub>52</sub>	C <sub>1</sub> IV	2	<i>Bos indicus</i>	m <sub>2</sub>	24.39	13.51
M <sub>57</sub>	C <sub>1</sub> IV	2	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	22.76	17.38
M <sub>212</sub>	D <sub>2</sub> II	2	<i>Bos indicus</i>	p <sub>3</sub>	18.15	12.16
M <sub>281</sub>	D <sub>1</sub> III	2	<i>Bos indicus</i>	m <sub>3</sub>	35.18	13.42
M <sub>365</sub>	ZD <sub>1</sub> IV	2	<i>Bos indicus</i>	m <sub>2</sub>	22.59	--
M <sub>360</sub>	ZD <sub>1</sub> IV	2	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	30.89	11.62
M <sub>417</sub>	B <sub>1</sub> IV	2	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	24.78	12.25
M <sub>447</sub>	C <sub>1</sub> III	2	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	28.28	14.27
M <sub>448</sub>	C <sub>1</sub> III	2	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	26.35	13.65
M <sub>265</sub>	D <sub>1</sub> I	2	<i>Capra hircus</i>	m <sub>1</sub> /m <sub>2</sub>	18.03	11.02
M <sub>214</sub>	D <sub>2</sub> II	2	<i>Capra /Ovis</i>	m <sub>1</sub> /m <sub>2</sub>	11.50	5.30
M <sub>3</sub>	D <sub>1</sub> IV	3	<i>Bos indicus</i>	p <sub>4</sub>	19.78	10.19
M <sub>4</sub>	D <sub>1</sub> IV	3	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	26.62	12.81
M <sub>7</sub>	D <sub>1</sub> IV	3	<i>Bos indicus</i>	m <sub>3</sub>	37.64	17.13
M <sub>199</sub>	C <sub>1</sub>	3	<i>Bos indicus</i>	p <sub>4</sub>	15.90	12.70
M <sub>201</sub>	C <sub>1</sub>	3	<i>Capra /Ovis</i>	i <sub>2</sub>	6.09	2.86
M <sub>129</sub>	ZD <sub>1</sub>	6	<i>Bos indicus</i>	m <sub>1</sub> /m <sub>2</sub>	27.5	14.82
M <sub>301</sub>	C <sub>1</sub> II	U <sub>30</sub>	<i>Equus sp.</i>	p <sub>2</sub>	25.5	--
M <sub>318</sub>	B <sub>1</sub> II	U <sub>31</sub>	<i>Bos indicus</i>	m <sub>3</sub>	32.9	--
M <sub>320</sub>	B <sub>1</sub> II	U <sub>31</sub>	<i>Bos indicus</i>	dp <sub>2</sub> /dp <sub>3</sub>	24.44	--
M <sub>177</sub>	ZD <sub>1</sub>	U <sub>34</sub>	<i>Bos indicus</i>	dp <sub>4</sub>	34.00	9.36