A Glimpse of Animal Utilization Pattern at Khirsara, Kachchh, Gujarat, India

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***Abstract**: The Excavation Branch-V of the Archaeological Survey of India, Vadodara, Gujarat carried out excavation at the ancient site of Khirsara in 2010-2012. The site, locally known as 'Gadhwali Wadi' is located approximately 85 km from Bhuj. Khirsara (23° 27 N; 69° 03 E) has yielded evidence of Harappan period settlement. The faunal material recovered from the site has been analysed both qualitatively and quantitatively by using standard archaeozoological techniques. The sample of the faunal assemblage analysed consisted of 3296 skeletal fragments. Out of which 2793 fragments could be identified to the species level. The analysis revealed the presence of several domestic animals – cattle (Bos indicus), buffalo (Bubalus bubalis), sheep (Ovis aries), goat (Capra hircus), pig (Sus domesticus), dog (Canis familiaris), cat (Felis catus) and domestic fowl (Gallus domesticus). A wide spectrum of wild mammals utilized included nilgai (Boselaphus tragocamelus), blackbuck (Antilope cervicapra), gazelle (Gazella bennettii), spotted deer (Axis axis), four-horned antelope (Tetracerus quadricornis), wild pig (Sus scrofa) and Indian hare (Lepus nigricollis). The non-mammals identified at Khirsara were Indian Sawback turtle (Kachuga tecta), a crab species (Scylla serrata) and several varieties of fish and molluscan shells. This paper draws inferences from faunal analysis to highlight different aspects of animal utilization at Khirsara. It compares the observed faunal diversity at Khirsara with other known sites in Kachchh such as Kanmer, Surkotada, Kuntasi and Juni Kuran.*

Keywords: Indian Faunal Studies, Zooarchaeology, Archaeozoology, Kachchh, Mature Harappan, Animal-based Subsistence, Archaeo-faunal Diversity

Introduction

The ancient site of Khirsara (23° 27' N; 69° 03' E) was first reported by the Department of Archaeology, Government of Gujarat in 1969-70 (IAR 1969-70: 5). It is being excavated by the Excavation Branch-V, of the Archaeological Survey of India,

Vadodara since 2010. Khirsara, a small village in western Kachchh, lies at a distance of about 85 km northwest of Bhuj on the Bhuj-Narayan Sarover State Highway (Fig. 1-3). The site locally known as 'Gadhwali Wadi' is located in the southeastern outskirts of the present village. This fortified settlement, trapezoidal in shape (roughly 310 x 230 m). The evidences found during the last two seasons of excavations indicate that the entire deposit belongs to the mature phase of Harappan culture which can further be divided into two sub-periods - A and B on the basis of materials discovered from the different levels of the site (Nath 2012; Nath *et al*. 2012). The faunal material recovered from the site from both years' excavation is being analysed. This article is based on a sample of 3296 skeletal fragments to have a glimpse of the animal utilization at Khirsara. Also this paper is aimed to compare the observed faunal diversity at Khirsara with other known sites such as Kanmer, Shikarpur, Surkotada, Kuntasi and Juni Kuran.

The Methods

A standard archaeozoological protocol established at the Archaeozoology Laboratory of the Deccan College was followed. Clason's (1972) method of counting the specimens was followed, in which ancient fragments of a single skeletal element were not treated as separate entities. Securely identifying a skeletal fragment is vital component of such a protocol for valid archaeozoological interpretations. For species identification, the basic distinguishing markers were derived from the reference collection of animal skeletons housed at the Archaeozoology Laboratory, Deccan College, Pune and the Osteology Laboratory, M.S. University Baroda. 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 distinguishing between the blackbuck (*Antilope cervicapra*) and spotted deer (*Axis axis*). In addition, help was also taken from Miguad (1992), Gupta *et al.* (1987, 1990) and Higham (1975). In case of molluscan shell identification, help was taken from published works of Subba Rao (1989) and Apte (1998).

In spite of best efforts to identify the skeletal elements, a number of the fragmentary ones (ribs, vertebrae, carpals and tarsals), could not be identified to the species level. These were grouped into a broad class such as cattle/buffalo (*Bos*/*Bubalus*), goat/sheep (*Capra*/*Ovis*), blackbuck/chital (*Antilope*/*Axis)* and deer (*Cervus*/*Axis*). Similarly, many fragments of birds, reptiles and fish could not be identified to generic level. Thus, all these fragments have been treated separately. The fragments that were devoid of any distinguishing characters were classified into three categories: large (UF-L), medium (UF-M) and small (UF-S). This classification was based on a pure personal judgment of the size. However, the large, medium and small unidentified fragments were approximately 5-15 cm, 2-5 cm and less than 1 cm long, respectively.

Every bone fragment was examined thoroughly and the signatures of both pre- and

post-depositional factors (like human, carnivore and rodent activity) were noted using criteria provided by Fisher (1995). The intentionally 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 studied in the light of first author's unpublished observations carried out on carnivores such as hyenas, jackals, dogs and cats.

All the observations including on the bone modification were recorded in a computerized coded format. These coded forms were analysed by using DCPARZ – computer software developed at the archaeozoology laboratory by the author in late 1980s. Measurements were recorded of all measurable bones following A. von den Driesch (1976). Each fragment was described and those bearing marks of natural/human actions were given a serial number. After the study was over, the faunal material was carefully restored back to their respective packets so that the observations and inferences stand verifiable at any future time point.

Faunal Material

A total of 3296 skeletal fragments were examined and 2793 fragments could be identified to the species level. It was not possible to identify 503 fragments (Fig. 4). The identification level is satisfactory and as high as 84.74%, mainly because of good preservation conditions and low degree of fragmentation of bones. Many fragments are found with considerable amount of encrustations (silica particles). Most of the fragments are found to be buried in soil without much secondary disturbances. Evidence of trampling and wearing due to physical movements within the deposit was negligible.

Bone Modifications

A total of 66 bone modifications (2.36%) were observed (Table 1). Charring to various degrees was noticed in case of 24 fragments of which 2 fragments were completely charred and 3 fragments were vitrified. In layer 2 one rib fragment of cattle/buffalo and one astragalus of cattle (KRS473) were vitrified. In layer 3 two fragments that were vitrified were a vertebra and calcaneum of cattle/buffalo. Only two fragments were charred completely from layer 3 – a distal end of humerus and a rib of cattle. All these charring marks are due to food processing activities such as roasting before consumption. A total of 20 bones were found with various kinds of cut marks and four bones are found with butchering marks (Table 1). Some are shallow cuts meant for meat separation while some others are sharp, deep butchering marks.

Four bone fragments (all from layer 2) were found with intentional modifications, i.e., made into tools. Many such bone fragments possess modified sharp edges which are viable enough to use as scrapers, points, etc. Splinters of long bones were mostly used in this fashion with some secondary retouched edges. One small point of 4.5 cm length deserves special attention. It has been shaped into cylindrical form though it seems to be incomplete.

One elephant ivory fragment recovered from layer 2 (KRS514) was modified to make some kind of useful article or a craft object. The object seems to be incomplete. Other alterations in bones have been noticed in the form of carnivore teeth marks and rodents gnawing at the bones after these were discarded. Evidence of carnivores (most likely the dogs) scavenging the bones has been found from layer 1, 2 and 5. The dogs have modified 11 fragments. The skeletal elements chewed by the scavengers include humerus (5), ulna (1), femur (1), astragalus (2), calcaneum (1) and one cervical vertebra, all of cattle.

Table 1: Bone modifications observed at Khirsara

Layer	**1**	**2**	**3**	**4**	**5**	**Total**	**Percentage of NISP**
Slightly charred	1	10	5	2	1	19	0.68
Completely charred	0	0	2	0	0	2	0.07
Charred and vitrified	0	2	2	0	0	4	0.14
Butchering marks	0	2	0	0	2	4	0.14
Cut marks	1	16	2	0	1	20	0.72
Rodent teeth marks	0	1	0	0	0	1	0.04
Carnivore marks	1	7	0	0	3	11	0.39
Bone tools	0	4	0	0	0	4	0.14
Ornaments	0	1	0	0	0	1	0.04
Total	**3**	**43**	**11**	**2**	**7**	**66**	**2.36**
NISP=2793							

The Species

The analysis of the sample revealed the presence of several domestic animals – cattle (*Bos indicus*), buffalo (*Bubalus bubalis*), sheep (*Ovis aries*), goat (*Capra hircus*) and dog (*Canis familiaris*) and a wide spectrum of wild mammals (Fig. 5-12).

Besides these animals identified from the sample, domestic pig (*Sus domesticus*), cat (*Felis catus*), domestic fowl (*Gallus domesticus*) and blackbuck (*Antilope cervicapra*) were consumed at Khirsara. The non-mammals identified at Khirsara were Indian Sawback turtle (*Kachuga tecta*), conch (*Turbinella pyrum*), a crab species (*Scylla serrata*) and several varieties of fish. These identifications were done while faunal material was observed at the site during excavation.

The proportion of domestic animals was very large (98.61%) in the total assemblage. The major share of the skeletal elements came from the cattle and buffalo. Together as important food species these two contributed 87% of the NISP. Cattle (*Bos indicus*) were the predominant animals, however, the paucity of identifiable criteria rendered the precise identification difficult in certain cases. Hence, out of 2430 identifiable bones of cattle and buffalo, 70 fragments could be assigned definitely to the cattle, while 2358 were classified as of *Bos*/*Bubalus*. It was possible to identify only two skeletal elements securely as of domestic buffalo from layer 2.

The skeletal assemblage of cattle and buffalo contained both meat bearing and non-meat bearing parts suggesting that the carcass processing activities were taken within the site from time to time. The butchering activities noticed on skeletal fragments of both cattle and buffalo suggest that both meat and bone marrow were utilized by the inhabitants at Khirsara. Though buffalo was represented only in the form of two skeletal fragments, the cut marks on these bones suggest that buffalo was also part of the diet.

In terms of ratio, sheep and goat (11.56 %) come next only to cattle and buffalo in domestic category (Table 2). As was the case with cattle and buffalo, the lack of morphological criteria in many cases rendered the precise identification. Due to this methodological constraint only three fragments of goat (*Capra hircus*) could be identified securely, while 320 fragments were classified as of *Capra*/*Ovis*. Though this sample did not show definitive evidence of the sheep (*Ovis aries*) the sheep has been identified from other areas at Khirsara. Skeletal evidence points to the significance of these animals entirely for food. The skeletal assemblage of *Capra*/*Ovis* brought to light a mixed collection and suggest that these animals were kept within the site and culled for food. The other domestic animal was dog and with certainty it was not included in the diet of the people.

Table 2: Proportion of various species identifed at Khirsara

Layer	**1**	**2**	**3**	**4**	**5**	**6**	**NISP**	**Percentage of NISP**
Bos indicus	2	39	4	12	9	4	70	2.506
Bos/Bubalus	134	1265	366	255	280	58	2358	84.43
Bubalus bubalis	0	2	0	0	0	0	2	0.072
Capra hircus	0	1	2	0	0	0	3	0.107
Capra hircus/Ovis aries	15	122	75	63	41	4	320	11.46
Canis familiaris	0	0	1	0	0	0	1	0.036
Boselaphus tragocamelus	2	1	0	0	0	0	3	0.107
Gazella bennetti	0	1	0	0	0	0	1	0.036
Tetracerus quadricornis	0	1	0	0	0	0	1	0.036
Axis axis	1	1	0	0	0	0	2	0.072
Sus scrofa	1	2	0	4	2	0	9	0.322
Lepus nigricollis	2	1	2	3	4	0	12	0.43
Elaphas maximus	0	1	0	0	0	0	1	0.036
Fish-Large	1	2	1	1	0	0	5	0.179
Fish-Medium	0	0	0	1	0	0	1	0.036
Fish-Small	0	0	0	1	0	0	1	0.036
Turbinella pyrum	0	2	0	0	0	0	2	0.072
Scylla serrata (Crab)	0	1	0	0	0	0	1	0.036
Total	**158**	**1442**	**451**	**340**	**336**	**66**	**2793**	**100**

Wild mammals constituted only 1.04% of the NISP (Table 2). These included the nilgai (*Boselaphus tragocamelus*), wild pig (*Sus scrofa*), spotted deer (*Axis axis*), gazelle (*Gazella bennetti*), four-horned antelope (*Tetracerus quadricornis*) and hare (*Lepus nigricollis*). Most of these wild mammals were represented manly by their meat-bearing parts. This suggests that mostly these animals were butchered outside the settlement and only select meat-bearing portios were brought in the settlement.

The non-mammals utilized for food included a variety of fish and an edible crab species (*Scylla serrata*). *Turbinella pyrum* was the lone molluscan species identified from the sample. As it has been observed at several other Harappan sites of Gujarat, this species was utilized in the shell industry as a raw material.

Other Sites

Kuntasi (KTS)

Kuntasi (22° 53' N; 70° 32' E) was an important Harappan port town in the northern Kathiawad region. A part of very large faunal assemblage mainly from the 1987-88 excavations was studied by Thomas *et al.* (1996). The material studied by them belonged to all the cultural phases - Phase A and B (Mature Harappan) and C (Late Harappan), recognised at the site. A total of about 9 domestic and 23 wild species of wild animals belonging to mammals, reptiles and birds were identified at the site (Tables 3-4). In addition, a variety of fish and crabs, which could not be identified up to the species level, were also found. The pattern of animal utilization appears to be almost consistent in all the phases of Kuntasi. However, a closer look at the distribution pattern of different species in different layers revealed that the exploitation was not fully consistent (Goyal 2012). Only a few species were represented between layers 14 to 19 (belonging to the Mature Harappan). Between layers 7 to 13 (within the Mature Harappan period), a moderate increase in the number of exploited species is noticed. However, the maximum representation of animal species has been noticed between layers 1 to 6 representing the Late Harappan phase at the site (Thomas *et al.* 1996: 305). This may suggest that residents during the Mature Harappan phase relied heavily on the meat of domestic animals and exploitation of wild fauna was very less in this phase. However, during the Late Harappan phase the residents started to utilise more wild resources including birds, fishes and crabs.

Shikarpur (SKR)

The ancient site of Shikarpur (23° 14′ 15″ N; 70° 40′ 39″ E), locally known as *Valamiyo Timbo* is situated at a distance of 5 km southwest of the present village of the same name in Bhachau taluka, district Kachchh, Gujarat. This site first excavated during 1987-1990 by the Gujarat State Department of Archaeology. The faunal remains of this excavation have been studied (Thomas *et al.* 1995). Shikarpur was excavated again by the Department of Archaeology and Ancient History; M.S. University of Baroda from 2007-08 to 2011-2012. The recent excavations brought to light a total of 6.40 m deposit showing a three-fold sequence in the Harappan occupation at the site. The early phase

(Phase I) entirely belonging to the Classical Harappan is represented by about 3 m cultural deposit. This phase is followed by Phase II that is distinguished by the preponderance of the Sorath Harappan pottery. The total thickness of this habitation deposit is approximately 1.40 to 1.60 m. Phase III deposit represented the last phase of the Harappan occupation at the site. Habitation debris of this phase is thin, patchy and is generally confined to the top 10 to 20 cm form the surface as well as in ashy pits. This phase is marked by the Late Harappan material (Personal communication: Prof. Ajithprasad of M.S. University of Baroda).

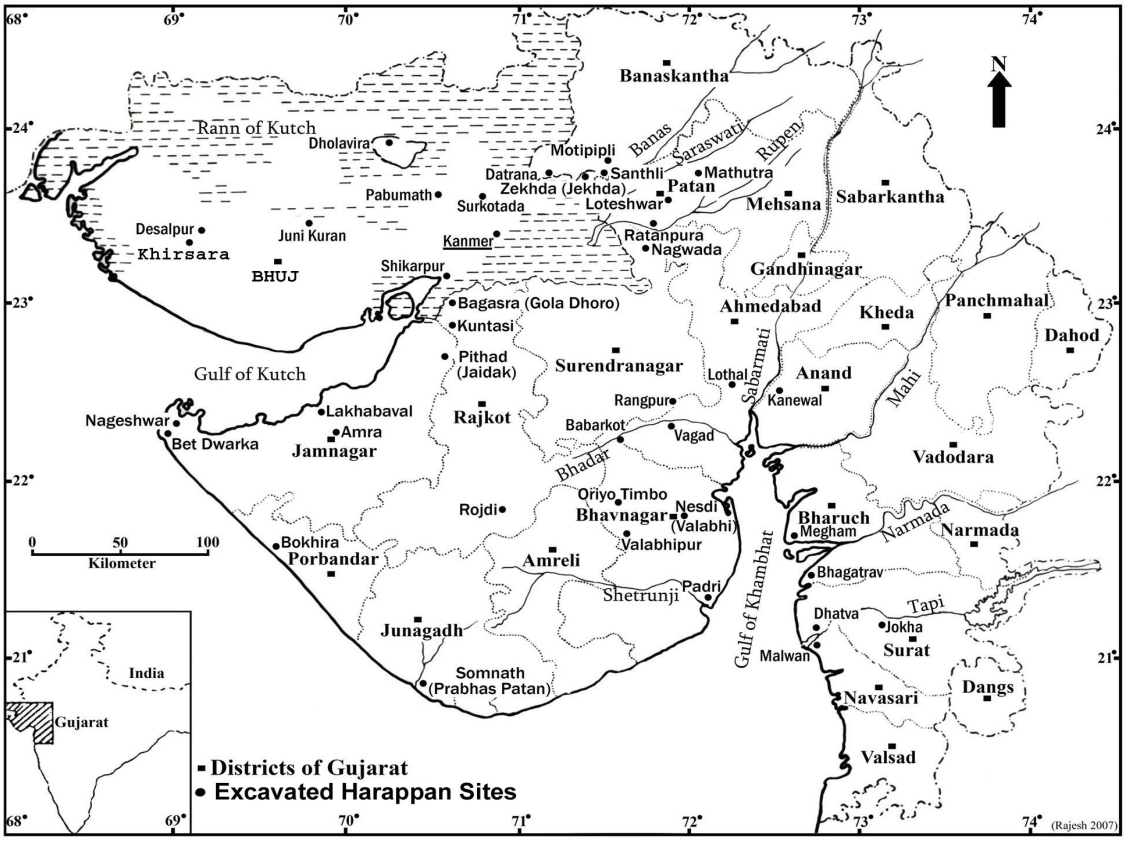


Figure 1: Location map of Khirsara and other sites



Figure 2: General view of Khirsara



Figure 3: View of excavation at Khirsara

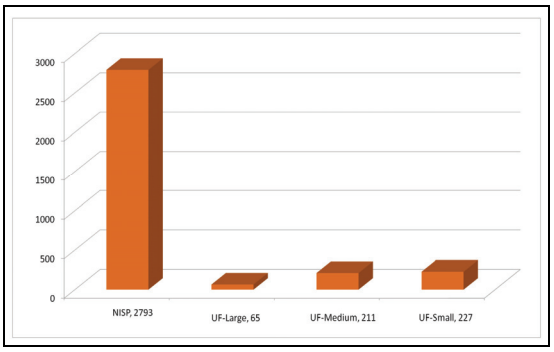


Figure 4: Summary of identification



Figure 5: Metapodia of *Bos indicus*



Figure 6: Astragalli of *Bos indicus*



Figure 7: Mandible of domestic pig



Figure 8: Third metatarsal of domestic pig



Figure 9: Skeletal elements of the goats



Figure 10: Blackbuck horn core



Figure 11: Fish vertebrae



Figure 12: Shell waste, *Turbinella pyrum*

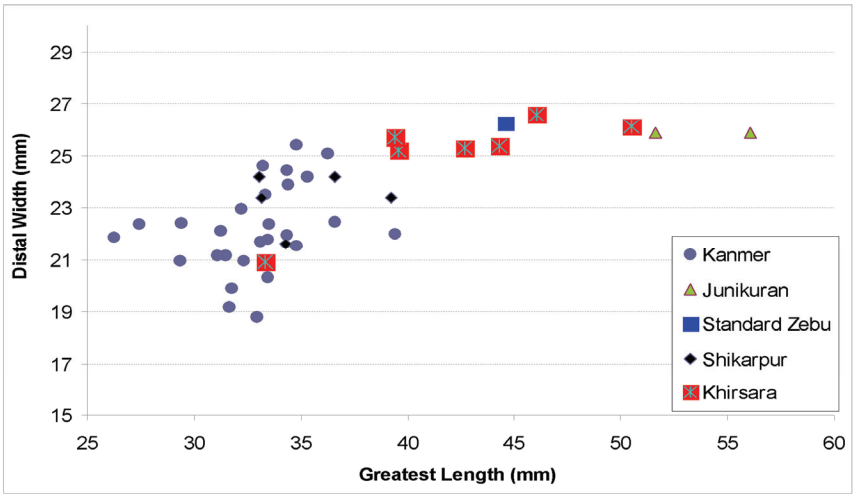


Figure 13: Measurements of *Bos indicus* astragalli

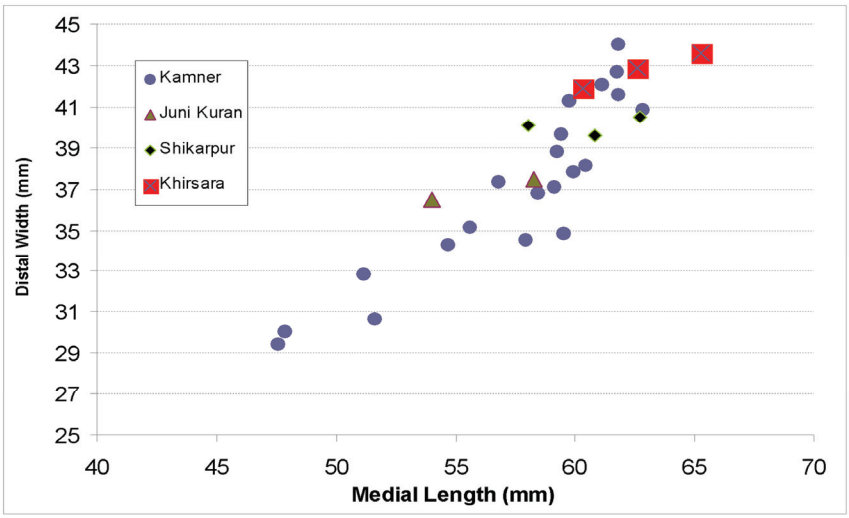


Figure 14: Measurements of *Bos indicus* first phalanges

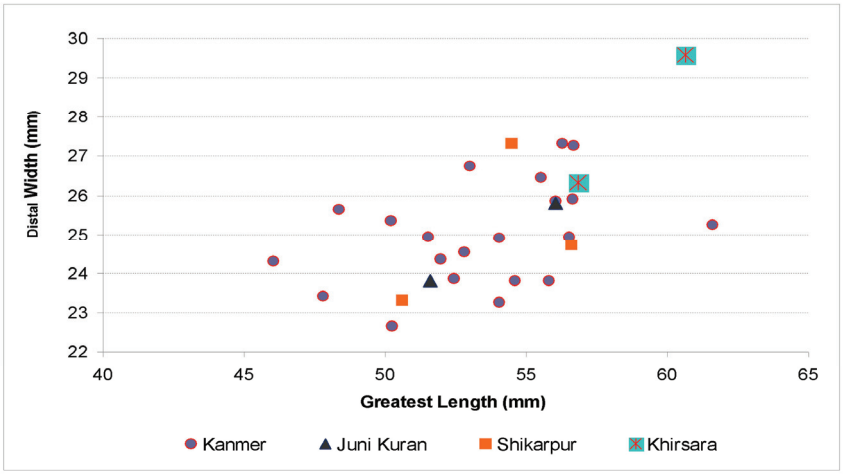


Figure 15: Measurements of *Bos indicus* second phalanges

The animal skeletal remains collected during the course of excavation are housed at the M.S. University, Baroda (Gujarat State, India). The analysis was done at Baroda during a visit in 2008. With a view to obtain a preliminary picture of animal-based economy at Shikarpur, faunal sample (n=6250) from a single trench ES4 was selected.

This analysis (Joglekar and Goyal 2011) revealed a large number of animal species that includes domestic mammals, wild mammals (Tables 3-4), reptiles, birds, crabs and molluscan species. Besides seven domestic mammals (cattle, buffalo, sheep, goat, pig, dog and cat), twelve wild mammalian species identified include the nilgai, wild pig, antelopes (blackbuck and chinkara), deer (sambar and chital), elephant, hyena, wild ass, porcupine, hare and house rat.

The faunal material recovered from Shikarpur has a large number of non-mammalian animal remains - two species of birds (Domestic fowl and common crane) and reptiles (Chitra turtle and soft shell turtle), and several molluscan species (*Zootecus insularis*, *Turbinella pyrum*, *Paphia gallus*, *Anadara rhombea*, *Anadara scapha*, *Chicoreus ramosus*, *Pugilina buchephala*, *Indoplanorbis exustus*, *Fasciolaria trapezium*, *Marcia recens*, *Dentalium* sp., *Lamellidens* sp., *Viviparus* sp., *Conus* sp., and *Corbicula* sp.). Also, a few fragments of other non-mammals like crabs and fishes were also recovered. However, it was not possible to identify many such skeletal elements up to the genus or species level.

Juni Kuran (JKN)

The site of Juni Kuran (23º 27′ N; 69º 47′ E) is located close to the Indo-Pakistan border on the north-eastern corner of Pascham Beyt in taluka Bhuj, district Kachchh, Gujarat. It is located. The site was reported by J.P. Joshi of the ASI during the explorations in the Kachchh in 1968-69 and was excavated by the Vadodara Circle of the ASI in 2003-2004 under supervision of Subhra Pramanik. The site showed cultural deposits of two periods: Period I- Mature Harappan and Period II- Late Harappan.

A small sample of the faunal material was examined. The analysis revealed presence of cattle and buffalo, goat/sheep, blackbuck, four-horned antelope, wild pig (*Sus scrofa*), hare (*Lepus nigricollis*), catfish, *Turbinella pyrum*, and a crab species (Dr. P.K. Thomas personal communication, 2007).

Surkotada (SKD)

The faunal material from Surkotada (23° 37' N; 70° 50' E), a fortified Harappan settlement in Kachchh was studied by Sharma (1990). It is important to note that an earlier report dealing with faunal remains from the site (IAR 1971-72: 21) mentions the presence of animals like hyena, wild pig, nilgai and blackbuck at Surkotada, whereas there is no reference of these animals in the final report (Sharma 1990). Phase IA, the earliest occupation phase at the site revealed the presence of cattle, sheep, goat, dog, horse, ass, deer, fowl, jackal, rodents and fish. In addition to the species identified at Phase IA, camel and wolf were also present in the faunal assemblage belonging to

Phase IB. Phase IC, the last phase at the site yielded overwhelming faunal remains both quantitatively and in terms of number of species.

Kanmer (KMR)

Kanmer, locally known as Bakar Kot was first discovered by R.S. Bisht, Y.S. Rawat and other Archaeological Survey of India (ASI) team members in 1985. This fortified (110 m E-W and 120 m N-S) has cultural deposit of 11 m (Kharakwal *et al*. 2012). Based on analysis of the cultural material the excavators identified a five-fold cultural sequence at the site of which Period II represents the Mature Harappan Phase.

Entire faunal material (n= 50491) recovered at Kanmer has been studied in various stages where samples were analyzed for specific goals - 2005-06 excavation (Joglekar 2007), 2006-07 excavation (Goyal and Joglekar 2010), 2007-08 excavation (Goyal and Joglekar 2011), and Goyal (2012). All these analyses revealed a wide spectrum of diverse fauna consisting of mammals, reptiles, birds, fish and molluscs.

Table 3: List of domestic mammalian species identifed at Mature Harappan sites

Site	**KTS**	**SKR**	**KMR**	**SKD**	**JKN**	**KHR**
Bos indicus	P	P	P	P	P	P
Bubalus bubalis	P	P	P	P	P	P
Ovis aries	P	P	P	P	P	P
Capra hircus	P	P	P	P	P	P
Sus domesticus	P	P	P	P	x	P
Canis familiaris	P	P	P	P	x	P
Felis catus	x	x	P	x	x	P
Equus caballus	P	P	x	P	x	x
Equus asinus	P	x	x	P	x	x
Camelus dromedarius	?	x	x	P	x	x

At Kanmer, domestic mammals were represented by seven species – cattle (*Bos indicus*), buffalo (*Bubalus bubalis*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus domesticus*), dog (*Canis familiaris*) and cat (*Felis catus*). Twenty-six wild mammals identified included the elephant (*Elaphus maximus*), panther (*Panthera pardus*), cheetah (?) (*Acinonyx jubatus*), nilgai (*Boselaphus tragocamelus*), wild pig (*Sus scofa*), wild ass (*Equus hemionus*), wolf (*Canis lupus*), blackbuck (*Antilope cervicapra*), chinkara (*Gazella bennetti*), four-horned antelope (*Tetracerus quadricornis*), sambar (*Cervus unicolor*), chital (*Axis axis*), barking deer (*Muntiacus muntjak*), mouse deer (*Tragulus meminna*), jungle cat (*Felis chaus*), civet cat (*Viverricula indica*) desert cat (*Felis libyca*), Indian fox (*Vulpes bengalensis*), monkey (*Macaca mulatta*), porcupine (*Hystrix indica*), mongoose (*Herpestes edwardsi*), hare (*Lepus nigricollis*), hedgehog (*Hemiechinus auritus*) and rodents (house rat, bandicoot rat and field mice).

The non-mammals include the species of birds (domestic fowl, peacock, partridge, duck, pond heron and crane) and reptiles (Chitra turtle, Indian sawback turtle, Indian mud turtle and monitor lizard). In addition, four species of fish have been identified (*Rita rita*, *Labeo rohita*, *Wallago attu*, *Channa* sp.). Several molluscan species were identified from the assemblage- *Anadara rhombea*, *Erosaria* sp., *Littorina* sp., *Chicoreus ramosus*, *Cypraea* sp., *Nerita crepidularia*, *Paphia gallus*, *Pugilina buchephala*, *Periglypta* sp., *Placuna placenta*, *Telescopium telescopium*, *Turbinella pyrum*, *Dentalium* sp., *Meretrix meretrix*, *Lamellidens* sp., *Olivia* sp. and *Turritella* sp.

Table 4: List of wild mammalian species identifed at Mature Harappan sites

Site	**KTS**	**SKR**	**KMR**	**SKD**	**JKN**	**KHR**
Boselaphus tragocamelus	P	P	P	x	P	P
Bubalus arnee	x	P	x	x	x	x
Capra hircus (wild)	x	P	x	x	x	x
Canis aureus	x	P	x	P	x	x
Canis lupus	x	x	x	P	x	P
Felis chaus	x	x	P	x	x	x
Felis libyca	x	x	P	x	x	x
Vulpes bengalensis	x	x	P	x	x	x
Viverricula indica	x	x	P	x	x	x
Panthera pardus	x	x	P	x	x	x
Elephas maximus	x	x	P	P	P	P
Rhinoceros unicornis	x	P	x	P	x	x
Equus hemionus	P	P	P	P	x	x
Equus sp.	P	x	P	x	x	x
Sus scrofa	P	P	P	x	P	P
Muntiacus muntjak	x	P	P	x	x	x
Cervus unicolor	P	P	P	x	x	P
Axis axis	x	P	P	P	P	P
Axis porcinus	x	P	x	x	x	x
Tragulus meminna	x	x	P	x	x	x
Gazella bannetti	P	P	P	x	P	P
Tetracerus quadricornis	x	P	P	x	P	P
Antilope cervicapra	P	P	P	x	P	P
Hystrix indica	x	x	P	x	x	x
Suncus stoliczkanus	x	x	x	P	x	x
Suncus murinus murinus	x	x	P	x	x	x
Melursus ursinus	x	x	x	x	P	P
Lepus nigricollis	P	P	P	P	P	P
Herpestes edwardsi	x	x	x	P	x	x
Macaca mulatta	x	x	P	x	x	x
Hemiechinus auritus	x	x	P	x	x	x
Rattus rattus	x	P	P	P	x	x

Concluding Remarks

The purpose of this study of faunal remains (only representative sample and not the entire collection) was to get a picture of faunal diversity at from Khirsara. Though the sample analyzed was small, it has given sufficient insight into the utilization of various animals throughout its occupation.

Faunal remains from Shikarpur have revealed a total of 19 species. In addition, at least ten species of molluscs have also been identified from this site (not discussed in this paper). A large number of these species have contributed in one way or the other to the food economy of the inhabitants. The faunal analysis of the sample showed that observed faunal diversity at Khirsara is comparable to other Harappan sites in the region. Like many other Hareappan sites in Gujarat, cattle were the most prominently utilized animals. The food economy was centred on cattle breeding.

The estimated cattle height at withers from Kanmer, Juni Kuran and Shikarpur indicate that majority of cattle fall within 110-115 cm range (Goyal 2012). This is well within the size range of some of the old cattle breeds which have their history of origin in and around the study region, especially Kankraj and Gir. A few estimates of cattle size are available from Khirsara. From the study of the bone measurements (Fig. 13-15) it is clear that cattle at Khirsara were more or less of the same size at those at Kanmer, Juni Juran and Shikarpur.

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