Animal Remains from the NBPW Contexts at Raipura, Sonbhadra District, Uttar Pradesh

P. P. Joglekar[1], Jayshree Mungur-Medhi[2], G. S. Abhayan[3], Vibha Tripathi[4] and Prabhakar Upadhyay[4]

1. Department of A.I.H.C. and Archaeology, Deccan College Post Graduate Research Institute, Pune – 411 006, Maharashtra, India *(Email: pramjog@gmail.com)*
2. Plaine Magnien Road, Magnien, Mon Desert, Mon Tresor, Des Places, Mauritius *(Email: jayshree.mm@gmail.com)*
3. Department of Archaeology, University of Kerala, Kariavattom Campus, Thiruvananthapuram – 695 581, Kerala (*Email: abhayangs@gmail.com*)
4. Department of A.I.H.C. and Archaeology, Banaras Hindu University, Varanasi – 221 005, Uttar Pradesh, India (*Email:vibhahist@gmail.com, prabhakarupadhyay.bhu@gmail.com)*

Received: 29 July 2018; Revised: 01 September 2018; Accepted: 05 October 2018
Heritage: Journal of Multidisciplinary Studies in Archaeology 6 (2018): 419-437

Abstract: *Raipura, excavated by the Department of A.I.H.C. and Archaeology, Banaras Hindu University in 2010-2011 is situated in tehsil Robertsganj, District Sonbhadra, Uttar Pradesh. Archaeological deposit was divided into three cultural periods: Period I (Pre-NBPW without metal), Period II (Pre-NBPW with Iron), and Period III (NBPW). Animal remains were collected from all three periods. These were studied using the standard method of faunal analysis developed at the Archaeozoology Laboratory, Deccan College. The study of faunal material recovered from Period I and II has been published earlier. This article is based on animal remains recovered from Period III. A total of 1069 skeletal fragments were examined. The faunal material revealed presence of five domestic species (cattle, buffalo, sheep/goat, pig and horse). The wild animal species were the gaur, nilgai, four-horned antelope, blackbuck, sambar, spotted deer, wolf, Jungle cat, Eurasian teal, rohu fish and freshwater mussel.*

Keywords: Faunal Material, Species, Bone Artefacts, Bone Tools, NBPW, Raipura, Uttar Pradesh

Introduction

Raipura (24° 40′ 40″ N; 82° 58′ 20″ E) is situated in tehsil Robertsganj, District Sonbhadra, Uttar Pradesh, at a distance of 100 km from Varanasi and at a distance of 16 km west of Robertsganj (Figures 1-3). Raipura was excavated by the Banaras Hindu University (Tripathi and Upadhyaya 2013; Tripathi 2014). The mound of Raipura extends over an area of approximately 400 x 350 m. It lies about 700 m south-east of present-day village. It is surrounded on three sides by a stream flowing down the hills.

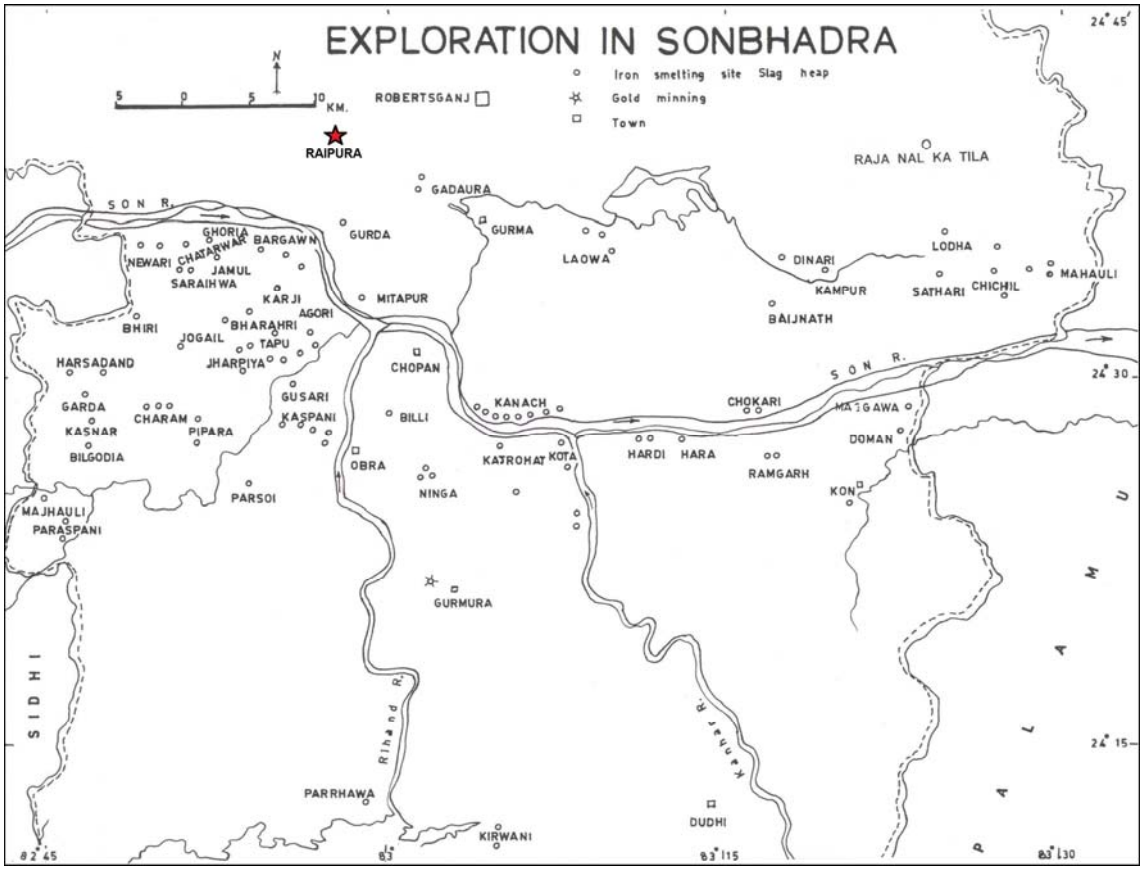

Figure 1: Location of Raipura, Mirzapur District, Uttar Pradesh

Figure 2: General View of the Site

Figure 3: Furnace from Period III

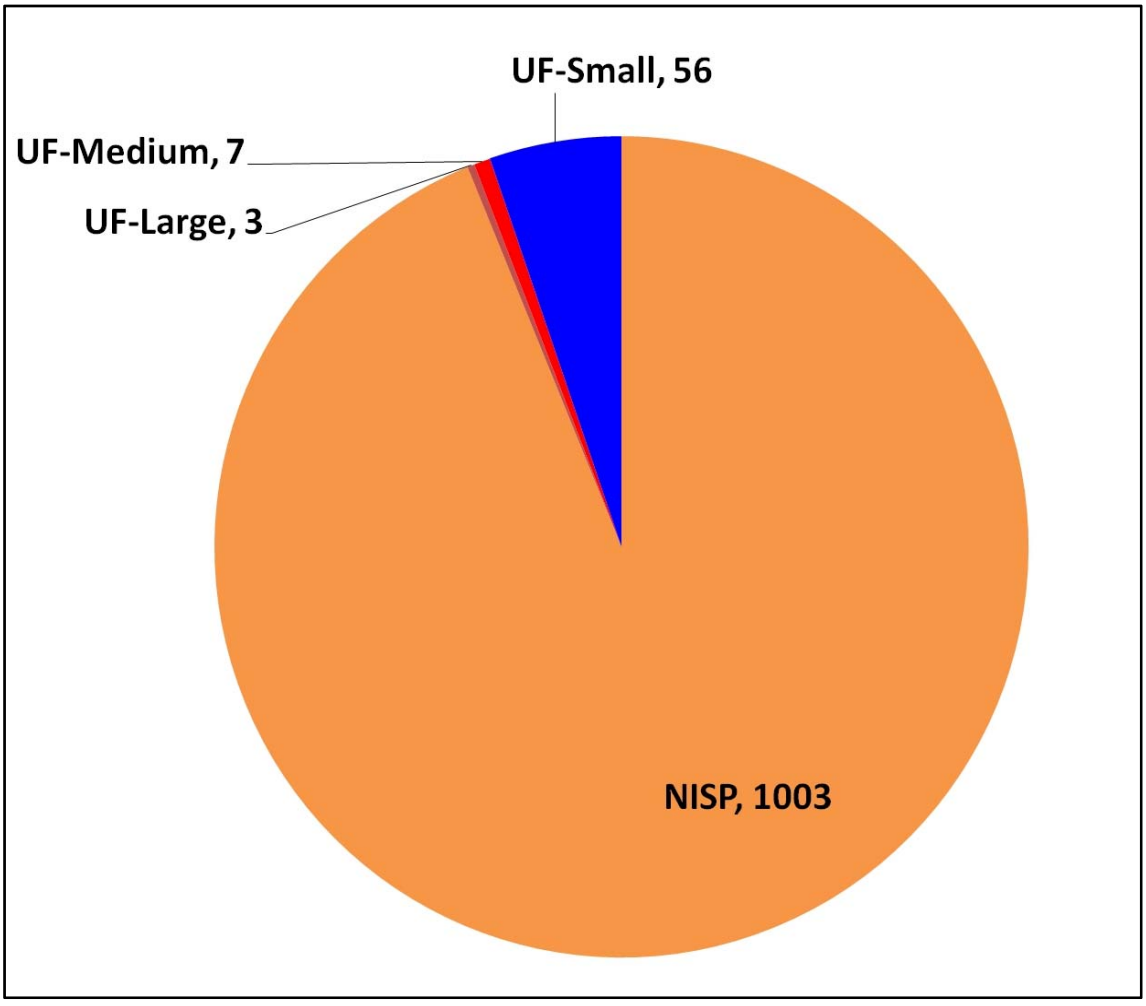

Figure 4: Raipura Period III, Summary of Identification

The stream has cut the mound into two parts- designated as Mound 1 and Mound 2. The northern part was labelled by us as Mound 1. The southern part which is approximately four times larger than Mound 1 was labelled as Mound 2. A total of ten trenches of 5 x 5 m were dug on Mound I whereas a single trench of 3 x 3 m was opened on Mound 2. Based on ceramic assemblage, archaeological deposit has been divided into three cultural periods: Period I (Pre-NBPW without metal), Period II (Pre-NBPW with Iron), and Period III (NBPW). The results of analysis of the faunal material from Period I (n=437) have been published (Joglekar *et al*. 2016). The faunal material (n= 889) from Period II also has been studied in entirety (Joglekar *et al*. 2017). This article is based on animal remains recovered from Period III contexts.

The Methods

A standard protocol of the laboratory analysis, data storage and quantitative analysis has been developed at the Archaeozoology Laboratory, Deccan College in the 1990s as per internationally accepted norms (Reitz and Wing 1999). Each bone fragment was thoroughly examined to find out the impact of both pre- and post-depositional factors. Bone modification signatures that were searched include intentional fractures (Sadek-Kooros 1975) as well as accidental breakage of bones both in the past and after their recovery during the excavation process. The results of bone identification and where it was possible to measure bones, the measurements (von den Driesch 1976) were recorded in the computerized coded format used at the Deccan College.

DCPARZ –computer software developed at the Archaeozoology Laboratory by the first author in late 1980s was used to analyse the bones recoded in the standard format. Identification work was done at Banaras Hindu University in 2014. Only a few fragments were taken to the Archaeozoology Laboratory at Deccan College for confirmation. After the analysis was over select bones were photographed and all the studied material was restored back to the respective storage bags.

The Faunal Material

1069 fragments recovered from Period III contexts were examined (Table 1; Figure 4). It was possible to identify 1003 fragments (93.82%). Very few fragments could not be identified. The main reason was good preservation of the skeletal elements and a majority were complete or nearly complete. Almost all skeletal elements were devoid of encrustations. Thus, in general most of the skeletal elements looked fresh and the edges were not much abraded or rolled due to post-depositional physical factors. Also, the amount of unidentified splinters was found to be small (Table 1).

Table 1: Summary of Identification

Context	NISP	Unidentified Fragments	Total Fragments
Layer 1	303	17	320
Layer 2	504	38	542
Layer 3	196	11	207
Total	1003	66	1069

Nearly one-sixth of the identifiable material showed bone modifications: due to actions of both human and non-human agencies (Table 2). An example of bioturbation (a hole made by a root) was observed from trench ZH-10 (layer 3). The proximal end of cattle femur showed a hole that went from the anterior to the posterior surface. Two cases of pathological conditions were noticed. A cattle rib fragment recovered from layer 2 (RPA1135) showed neoplastic tumour-like growth where amorphous spongy tissue has been formed. A fragment of lateral surface of cattle pelvis (ilium) showed pitting activity where bone has got damaged and was irregularly healed (Figure 5). The assemblage from this period showed 12 fossilized bones (Table 3). These were recovered from layer 1 (5) and layer 2 (7). It is not clear if these skeletal elements represent faunal material from earlier periods at the site, though no such fossilized bones were reported from Period I at Raipura (Joglekar *et al*. 2016). However, the condition of these heavy skeletal elements is intriguing.

Table 2: Period III - Bone Modifications

Layer	1	2	3	Total	Percentage
Slightly charred	4	11	2	17	1.69
Completely charred	3	10	1	14	1.40
Charred and vitrified	0	4	3	7	0.70
Butchering marks	1	0	0	1	0.10
Cut marks	19	15	7	41	4.09
Gnawing marks	1	2	0	3	0.30
Rodent teeth marks	3	3	4	10	1.00
Pathological condition	0	1	0	1	0.10
Fossilized	5	7	0	12	1.20
Bone tools	19	30	11	60	5.98
Total	55	83	28	166	16.6
% calculated with respect to NISP=1003					

Carnivore (perhaps dogs) bone modification activities were seen in case of only three specimens. These were the proximal end of cattle metacarpal (trench YG-12, layer 1), mandible of cattle (trench ZB-10, layer 2), and calcaneum of cattle (trench ZB-10, layer 2). The activities of rats modifying the bones were observed in a number of cases (Figure 6), from all three layers, though rat skeletal elements were not recovered from this period (Table 2).

Marks of anthropogenic activities such as charring and cutting were seen in a few cases. Only 3.79% of the identified fragments were charred. Seven skeletal elements were completely charred and vitrified. Except an ulna fragment of horse, others belonged to cattle. The condition of these vitrified bones indicated that they were accidently exposed to fire for long time. Cut marks were observed on 4.09% of the identified fragments. Most of these were chopping marks created due to blows of sharp and heavy instruments (Figure 7). Multiple blade marks related to removal of muscles

during butchering were observed on proximal end of a tibia of domestic buffalo (RPA1208) recovered from trench YH-12 (layer 1). One case of smashing the bone was observed from layer 2 (trench ZB-10). Another smashed bone was a tibia shaft of cattle recovered from trench YI-12 (layer 2). The distal end of cattle humerus was smashed, perhaps with some heavy object. In general, the skeletal elements and the anatomical positions of the cut marks indicate that they were due to primary carcass processing. In general, the anatomical locations of the cuts were similar to those observed for Period II. One of the astonishing find of this period is modified horse bones. A cervical vertebra of horse (trench YI-12, layer 1) was cut in the middle of lateral-medial axis (Figure 8). Similarly, a right side ulnar fragment of horse (trench ZH-10, layer 3) was totally charred and vitrified.

Table 3: Fossilized Skeletal Elements Recovered from Period III

Context	Skeletal Element	Species
YG-12 (Layer 2)	Metatarsal	*Bos/Bubalus*
YI-11 (Layer 1)	Cranial fragment	*Bos/Bubalus*
YI-12 (Layer 1)	Humerus	*Bos/Bubalus*
YI-12 (Layer 1)	Mandible	*Bos indicus*
YI-12 (Layer 1)	Mandible	*Boselaphus tragocamelus*
YI-12 (Layer 1)	Femur	*Axis axis*
YI-12 (Layer 2)	Tibia	*Bos/Bubalus*
YI-12 (Layer 2)	Mandible	*Bos/Bubalus*
YI-12 (Layer 2)	Humerus	*Bos/Bubalus*
YI-12 (Layer 2)	Radius	*Bos/Bubalus*
YI-12 (Layer 2)	Centrotarsal	*Bos/Bubalus*
YI-12 (Layer 2)	Calcaneum	*Bos/Bubalus*

Figure 5: Pathological Condition

Figure 6: Marks of Rodent Activity

Figure 7: Chopping Marks

Figure 8: Cervical Vertebra of Horse with Cut Mark

An interesting feature of this period is recovery of as many as 60 bone tools (Table 4), including those already identified (such as the needles and arrowheads) during the excavation (Figures 9-10). These bone tools include points, end scrappers, side scrappers and borers. The tool types indicate that these tools were perhaps used for digging holes in soil and used for carcass/hide processing. One of these digging tools (RPA1044) made from humerus was cut in such a way that the trochlea could be used as a handle.

Table 4: Tools Recovered from Period III at Raipura Made Using Cattle Bones

Skeletal Element	Number
Horn core	1
Mandible	5
Scapula	7
Humerus	12
Radius	3
Metacarpal/Metatarsal	8
Pelvis	2
Femur/Tibia/Radius/Ulna	2
Femur	4
Tibia	13
Vertebra	1
Rib	2
Total	60

The Species

The species identified from this period were in general similar to those identified from the previous two cultural periods (Joglekar *et al*. 2016, 2017). Remains of both domestic and wild animals were recovered from all three layers (Table 5). As seen from Table 5 the faunal collection is dominated by the domestic species. The domestic animals identified were cattle (Figures 11-14), buffalo (Figures 15-18), sheep and goats (Figure 19), domestic pig (Figure 20) and horse.

Figure 9: Bone Tools from Period III

Figure 10: Bone Tools from Period III

Table 5: Period III - Number of Identified Specimens

Layer	1	2	3	Total	Percentage
Bos indicus	49	69	11	129	12.9
Bos/Bubalus	213	343	168	724	72.2
Bubalus bubalis	15	35	3	53	5.28
Capra hircus	0	3	0	3	0.3
Capra hircus/Ovis aries	6	25	2	33	3.29
Sus domesticus	0	4	0	4	0.4
Equus caballus	1	1	1	3	0.3
Bos gaurus	1	0	0	1	0.1
Boselaphus tragocamelus	9	10	3	22	2.19
Axis axis	4	0	1	5	0.5
Cervus unicolor	4	3	1	8	0.8
Tetracerus quadricornis	0	1	0	1	0.1
Antilope cervicapra	1	4	5	10	1
Canis lupus	0	1	0	1	0.1
Felis chaus	0	1	0	1	0.1
Anas crecca	0	3	0	3	0.3
Labeo rohita	0	0	1	1	0.1
Lamellidens sp.	0	1	0	1	0.1
Total	**303**	**504**	**196**	**1003**	**100**

The proportion of cattle, as has been observed in case of earlier periods, was more than all other species. However, the proportion of the buffaloes was also remarkable (5.28% of NISP). This is a remarkable departure from the situation in the pre-NBPW (with iron) phase. The study of epiphyseal fusions of various long bones and vertebrae indicated that animals of all ages were present. There were a few individuals (both cattle and buffalo) that were over the age of 5-6 years that were perhaps kept for heavy work and milk.

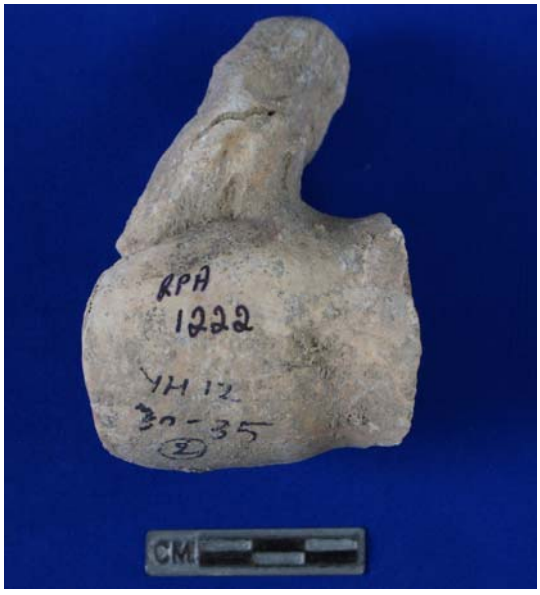

Figure 11: Cattle Humerus

Figure 12: Sharp Cut Mark in Cattle Femur

Figure 13: Cattle Astragalus

Figure 14: Pelvic Bone of Cattle

Figure 15: Maxilla of Buffalo

Figure 16: Tibia of Buffalo

Figure 17: Calcaneum and Metatarsal of Buffalo

The proportion of sheep/goat skeletal elements was small (3.59% of NISP) as compared to cattle. Although a few sheep bones were identified from Period I, like Period II material no sheep bones were found from the NBPW contexts. Thus, all the skeletal elements identified as of sheep/goat belonged to the goats. This observation indicates that perhaps for some reason the inhabitants of Raipura during the NBPW period have not preferred to have sheep herds.

Figure 18: Gnawing Mark

Figure 19: Humerus of Goat

Figure 20: Domestic Pig Remains

Figure 21: Third Phalanx of Nilgai

Table 6: Measurements of Mandibles from Period III at Raipura

Reg. No.		RPA1163	RPA1152	RPA1196	RPA1049	RPA166
Species		*Capra/Ovis*	*Capra/Ovis*	*Capra/Ovis*	*Capra/Ovis*	*Capra hircus*
Trench		YG12	YG12	YI11	YI12	XJ5
Layer/Unit		2	2	2	1	1
p2	Length	--	--	--	--	--
	Width	--	--	--	--	--
p3	Length	--	--	--	--	7.55
	Width	--	--	--	--	4.63
p4	Length	10.82	--	--	14.18	7.85
	Width	6.81	--	--	8.09	5.05
m1	Length	11.95	--	--	12.60	10.75
	Width	7.11	--	--	7.84	7.77
m2	Length	14.16	--	16.40	--	--
	Width	7.52	--	7.56	--	--
m3	Length	--	37.99	--	--	--
	Width	--	14.57	--	--	--

Table 7 Measurements of Mandibles from Period III at Raipura

Reg. No.		RPA1205	RPA769	RPA167	RPA168	RPA169	RPA1036
Species		*Bos indicus*	*Bos indicus*	*Bos indicus*	*Bos indicus*	*Bos indicus*	*Bos indicus*
Trench		YH12	YB12	XJ5	XJ5	XJ5	YI12
Layer/Unit		1	1	1	1	1	2
p2	Length	--	--	--	--	--	--
	Width	--	--	--	--	--	--
p3	Length	18.74	--	--	--	--	--
	Width	9.08	--	--	--	--	--
p4	Length	18.92	--	--	--	--	--
	Width	11.23	--	--	--	--	--
m1	Length	23.56	21.70		--	--	28.12
	Width	13.22	15.27		--	--	11.74
m2	Length	27.09	--	24.52	29.00	--	--
	Width	12.61	--	15.00	11.60	--	--
m3	Length	--	--	--	--	26.85	--
	Width	--	--	--	--	22.00	--

Domestic pig skeletal elements were identified from this period unlike earlier two periods. The proportion of the pigs was small, and the material came from only trench YI-12, layer 2. The skeletal elements identified were two cervical vertebrae, a mandible and a metapodium, all indicative of a single animal. Looking at this evidence, it seems that the inhabitants of Raipura have got this pig from elsewhere.

Table 8: Measurements of Mandibles and a Maxilla from Period III at Raipura

Reg. No.		RPA1005	RPA1211	RPA1040	RPA1204
Bone		Mandible	Mandible	Mandible	Maxilla
Species		*Bos indicus*	*Bubalus bubalis*	*Sus domesticus*	*Bos indicus*
Trench		YI12	YH12	YI12	YH12
Layer/Unit		2	1	2	1
p2	Length	--	--	--	--
	Width	--	--	--	--
p3	Length	--	--	--	--
	Width	--	--	--	--
p4	Length	--	--	--	--
	Width	28.08	--	--	--
m1	Length	11.11	--	11.28	--
	Width	--	--	10.55	--
m2	Length	--	27.86	17.05	--
	Width	--	15.55	12.13	--
m3	Length	--	--	--	29.06
	Width	--	--	--	25.04

Table 9: Measurements of Isolated Maxillary Teeth from Period III at Raipura

Reg. No.	Trench	Layer	Species	Tooth	Length	Width
RP1185	YI11	1	*Bos indicus*	M1	31.28	25.05
RP1114	ZB10	2	*Bos indicus*	M1	30.35	21.90
RP1278	ZB10	Pit	*Bos indicus*	M1	32.64	22.09
RPA765	YI11	3	*Bos indicus*	M2	24.76	19.15
RP1235	XJ5	1	*Capra/Ovis*	M2	16.53	11.49
RP1192	YI11	2	*Bos indicus*	M3	33.62	18.96
RPA766	YI11	3	*Bos indicus*	M3	28.45	21.13
RPA170	XJ5	1	*Bos indicus*	P2	17.15	13.63
RPA171	XJ5	1	*Bos indicus*	P2	18.54	11.9
RP1191	YI11	1	*Bubalus bubalis*	P3	14.60	20.04
RP1090	ZH10	2	*Bos indicus*	P4	20.03	14.64

There were three skeletal elements of the horse, one each from all three layers representing one animal each. As described earlier, the ulna fragment (layer 3) was in vitrified condition and the cervical vertebra recovered from layer 1 was cut with a sharp implement. Only the scapula fragment from trench ZH-10 (layer 2) did not show any signature of anthropogenic activity. From the pre-NBPW (with iron) phase, evidence of cutting of horse bone was noted (Joglekar *et al*. 2017). Based on the evidence from multiple layers at Raipura, it is likely that the horse bones were cut and/or charred in some ritual and the bones found in the habitation are remains of the ritual connected with horse as has been suggested in case of another site in the vicinity, i.e. Raja Nala Ka Tila (Joglekar 2010-2012).

Table 10: Measurements of Mandibular Teeth from Period III at Raipura

Reg. No.	Trench	Layer	Species	Tooth	Length	Width
RP1151	YG12	2	*T. quadricornis*	dp4	16.83	6.01
RP1081	ZH10	3	*B. tragocamelus*	m1	21.01	13.69
RP1162	YG12	2	*Bos indicus*	m1	28.72	12.26
RP1186	YI11	3	*Capra/Ovis*	m1	16.24	9.74
RP1197	YI11	2	*Bos indicus*	m1	23.77	13.65
RP1274	ZB10	Pit	*B. tragocamelus*	m1	26.68	15.06
RP1087	ZH10	3	*Bos indicus*	m3	40.86	15.27
RP1108	ZB10	1	*Bos indicus*	m3	33.48	12.96
RP1129	ZB10	2	*Bos indicus*	m3	--	13.29
RP1142	ZB10	2	*Bubalus bubalis*	p4	22.41	12.87

Table 11: Measurements of Humerus, Radius and Tibia Bones, Period III at Raipura

Reg. No.	Trench	Layer	Bone	Species	Proximal Width	Length of Capitis	Width of Capitis	Distal Width
RP1159	YG12	2	Humerus	*Capra hircus*	--	--	--	26.05
RP1194	YI11	2	Humerus	*Capra/Ovis*	--	--	--	26.66
RP1199	YH12	1	Humerus	*Bos indicus*	--	--	--	74.73
RP1223	YH12	2	Humerus	*Bos indicus*	--	68.54	73.74	--
RP1224	YH12	2	Humerus	*Bos indicus*	--	--	--	69.38
RPA1013	YI12	2	Radius	*Bubalus bubalis*	--	--	--	75.56
RPA1026	YI12	1	Tibia	*Bos indicus*	85.81	--	--	--
RPA 1104	ZB10	2	Tibia	*Bos indicus*	93.35	--	--	--
RPA 1164	YG12	2	Tibia	*A.cervicapra*	--	--	--	26.37
RPA 1213	YH12	2	Tibia	*Bos indicus*	--	--	--	56.08
RPA 1221	YH12	2	Tibia	*Bos indicus*	--	--	--	58.74

Table 12: Measurements of Metapodia from Period III at Raipura

Reg. No.	Trench	Layer	Bone	Species	Bp	Tp	Bd
RPA 1018	YI12	2	MC	*Bos indicus*	53.55	--	--
RPA 1019	YI12	2	MC	*Capra hircus*	21.62	--	--
RPA 1094	ZH10	1	MC	*Bos indicus*	--	--	--
RPA768	YI11	3	MC	*Bos indicus*	61.40	35.40	49.90
RPA1021	YI12	2	MT	*Bubalus bubalis*	61.98	--	--
RPA1112	ZB10	2	MT	*Bos indicus*	--	--	49.13
RPA1133	ZB10	1	MT	*B. tragocamelus*	38.58	--	--
RPA1158	YG12	2	MT	*Bos indicus*	41.20	--	--

Table 13: Measurements of Astragali and Centrotarsal Bones, Period III at Raipura

Reg. No.	Trench	Layer	Bone	Species	GLI	GLm	Bd
RP1009	YI12	2	Astragalus	*Bos indicus*	67.91	--	42.62
RP1080	ZH10	3	Astragalus	*Bos indicus*	79.11	70.87	47.42
RP1095	ZH10	1	Astragalus	*Bos indicus*	67.41	62.19	42.63
RP1130	ZB10	2	Astragalus	*Bos indicus*	66.91	63.00	39.45
RP1147	YG-12	2	Astragalus	*Bos indicus*	68.57	66.16	42.80
RP1160	YG12	2	Astragalus	*Bos indicus*	70.53	65.70	44.41
RP1199	YH12	1	Astragalus	*Bos indicus*	64.01	57.26	39.32
RPA754	YH11	3	Astragalus	*Bos indicus*	67.75	61.7	41.73
RPA755	YH11	3	Centrotarsal	*Bos indicus*	--	--	53.39
RPA758	YH11	3	Centrotarsal	*Bos indicus*	--	--	47.57
RP1010	YI-12	2	Centrotarsal	*Bos indicus*	--	--	56.11
RP1030	YI-12	1	Centrotarsal	*Bos indicus*	--	--	54.66
RP1150	YG12	2	Centrotarsal	*Bos indicus*	--	--	53.36
RP1182	YI11	1	Centrotarsal	*Bos indicus*	--	--	54.12

Table 14: Measurements of Calcaneum Bones from Period III at Raipura

Reg. No.	Trench	Layer	Species	1	2	3
RP1109	ZB10	2	*Bos indicus*	--	30.40	--
RP1011	YI12	2	*Bubalus bubalis*	--	35.15	--
RP1023	YI12	2	*Bubalus bubalis*	131.36	--	31.33
RP1157	YG12	2	*Bubalus bubalis*	138.39	34.31	--

There were a few bones of non-mammals (common Eurasian teal, rohu fish and freshwater mussel) indicating relatively less use of these resources during Period III at Raipura. The presence of common Eurasian teal (*Anas crecca*), one of the migratory birds during winter season, is an interesting find of this period like that of Period II.

The overall proportion of wild animals identified from this period was small (5.39%), similar to what has been observed for earlier periods at Raipura. Among the wild mammals the nilgai remains were found in large numbers (Figure 21), and from all three layers. The nature of skeletal elements recovered suggests that these animals were hunted or trapped on regular basis, perhaps when these animals came near cultivation for grazing. The other two species found from all three layers were the sambar (*Cervus unicolor*) and blackbuck (*Antilope cervicapra*). The distribution of the skeletal elements of these two species also indicates that these animals were hunted for food on a regular basis.

Bone Measurements

It was possible to record measurements in case of a few bones (Tables 6-16). All the measurements were recorded in mm using a digital caliper (least count 0.01 mm). The bone measurements are useful for comparing the animal population, and size of the

animals, especially the domestic ones kept at various archaeological sites within a cultural ambience or between sites of different cultures (Joglekar 2011).

Table 15: Measurements of First Phalanges from Period III at Raipura

Reg. No.	Trench	Layer	Species	GL	Bp	Tp	Bd
RP1047	YI12	1	*Bubalus bubalis*	63.20	--	29.00	27.64
RP1051	YI12	1	*Bos indicus*	65.63	--	28.56	26.40
RP1069	ZH10	3	*Bos indicus*	63.01	--	25.50	25.25
RP1078	ZH10	3	*Bos indicus*	66.42	--	29.06	28.51
RP1111	ZB10	2	*Bos indicus*	60.00	--	27.33	24.86
RP1119	ZB10	2	*Bubalus bubalis*	60.97	--	27.04	25.62
RP1131	ZB10	2	*Bubalus bubalis*	61.50	--	31.30	29.11
RP1138	ZB10	2	*Bubalus bubalis*	65.07	--	--	28.13
RP1154	YG12	2	*Bubalus bubalis*	63.85	--	29.40	28.55
RP1165	YG12	2	*Bos indicus*	61.48	--	--	27.43
RP1173	YI11	2	*Bos indicus*	--	--	--	28.78
RP1190	YG12	1	*Bubalus bubalis*	61.84	29.29	28.62	--
RP1193	YI11	2	*Bos indicus*	67.91	--	27.62	28.03
RP1236	YG-11	1	*Bos indicus*	57.15	--	27.72	25.56
RP1243	XJ-5	2	*Bos indicus*	58.78	--	28.90	26.36
RP1277	ZB10	Pit	*Bubalus bubalis*	62.29	--	29.18	28.78
RPA162	XJ5	1	*Bos indicus*	62.26	25.10	28.24	25.00
RPA163	XJ5	1	*Bos indicus*	--	--	--	25.10
RPA164	XJ5	1	*Bos indicus*	59.55	23.36	29.43	23.42
RPA165	XJ5	1	*Bos indicus*	55.47	26.97	30.93	28.57
RPA759	YH11	3	*Bos indicus*	63.84	32.53	32.56	32.07
RPA760	YH11	3	*Bos indicus*	56.36	23.32	26.62	24.00
RPA756	YH11	3	*Bos indicus*	62.42	25.88	30.9	24.7

Table 16: Measurements of Second Phalanges from Period III at Raipura

Reg. No.	Trench	Layer	Species	GL	Bp	Tp	Bd
RPA761	YH11	pit sb 3	*Bos indicus*	39.24	29.21	32.54	25.20
RPA762	YH11	pit sb 3	*Bos indicus*	38.84	23.92	28.7	19.77
RP1029	YI12	1	*Bos indicus*	41.36	27.17	--	20.04
RP1035	YI12	2	*Bubalus bubalis*	49.11	32.94	--	30.58
RP1107	ZB10	1	*Bos indicus*	45.75	26.70	--	25.73
RP1137	ZB10	2	*Bubalus bubalis*	46.38	35.31	--	32.45
RP1155	YG12	2	*Bos indicus*	45.32	29.30	--	27.24

It was possible to estimate the fat-free carcass weight of cattle using the distal end measurement of the humerus bone in two cases. The estimates were 146.93 kg (RPA1224) and 157.58 kg (RPA1191). Also, height of the cattle at the withers using the medial length of the astragalus could be estimated in case of seven individuals (116.83±

8.82 cm). The tallest one was 129.69 cm (RPA754) and the shortest one 104.79 cm (RPA1080). As it has been inferred for Period II, a few individuals were of massive built- those kept for breeding purpose or performing heavy-duty labour work (e.g. RPA754). The average height of cattle, though not statistically significant, was more than that observed in case of Period II at Raipura (Joglekar *et al*. 2017).

Concluding Remarks

As it has been concluded from analysis of faunal material of Period I - Pre-NBPW without metal contexts (Joglekar *et al*. 2016), and Period II – with iron contexts (Joglekar *et al*. 2016) the animal-based subsistence of the inhabitants was primarily based on rearing of domestic animals, cattle, buffalo and sheep/goat in particular. Evidence of young, sub-adult and old cattle indicated that animal husbandry based on cattle continued from its fully developed state during this period (NBPW). A few very old animals indicate their use as labour and /or milk, however, secure age profiles based on MNI could not be prepared for each layer. As it has been observed in case of Period I and Period II for the inhabitants of Raipura hunting/fishing was only supplementary in nature, as their main subsistence came from domestic animals.

Acknowledgements

The first three authors acknowledge the support given by Prof. R.N. Singh and Dr. Dheerendra Pratap Singh of the Department of A.I.H.C. and Archaeology, BHU during their stay at Varanasi. We express our since thanks to Barun Kumar Sinha for photography.

References

Joglekar, P.P. 2010-2012. Animal Remains from Raja Nal-ka-Tila, District Sonbhadra, Uttar Pradesh, *Pragdhara* 21-22: 227- 277.

Joglekar, P.P. 2011. Use of Quantitative Methods in Archaeozoological Research in India, *Pratna Samiksha New Series* 2: 55-68.

Joglekar, P.P., G.S. Abhayan, Jayshree Mungur-Medhi, Vibha Tripathi and Prabhakar Upadhyay 2016. Animal Remains from the Pre-NBPW (Without Metal) Contexts at Raipura, Sonbhadra District, Uttar Pradesh, *Heritage: Journal of Multidisciplinary Studies in Archaeology* 4: 105-120.

Joglekar, P.P., Jayshree Mungur-Medhi, G.S. Abhayan, Vibha Tripathi and Prabhakar Upadhyay 2017. Animal Remains from the Pre-NBPW (With Iron) Contexts at Raipura, Sonbhadra District, Uttar Pradesh, *Heritage: Journal of Multidisciplinary Studies in Archaeology* 5: 403-418.

Reitz, E. and E. Wing 2008. *Zooarchaeology*. Cambridge: Cambridge University Press.

Sadek-Kooros, H. 1975. Intentional Fracturing of Bone: Description of Criteria, in *Archaeozoological Studies* (A.T. Clason Ed.), pp. 139-150. Amsterdam: North-Holland Publication.

Tripathi, Vibha 2014. Recently Discovered Iron Working Site in Vindhya-Kaimur Region, India, *ISIJ International* 54(5):1010–1016 [DOI: http://dx.doi.org/10.2355/isijinternational.54.1010].

Tripathi, Vibha and Prabhakar Upadhyay 2013. An Ethno-technological Study of Iron Working around Sonbhadra Region, *Indian Journal of History of Science* 48 (2): 323-332.