Bone Modification and Taphonomic Study on Faunal Assemblage at Rakigarhi in Hrayana District

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Introduction

"Only a small part of what once existed was buried in the ground; only a part of what was buried has escaped the destroying hand of time, of this part all has not yet come to light again, and we all know only too well how little of what has come to light has been of service for thid eversince **Efremov (1940)** defined the science of taphonomy, a large body of publications has emerged dealing with taphonorny from palaeontological as well as archaeozoological perspectives **(Sathe 2008 and refrences given therein, Lyman 1994, Maltby 2006, Albarella et I. 2006)** taphonomy derived from Greek words "taphos" (burial) and "nomos" (laws) "taphonomy is the science of the laws of embedding Or burial. More completely, it is the study of the transition, in all details, of organisms from the biosphere into the lithosphere or geological record" **(R. Lee Lyman 1994 :71)**. Taphonomy is important to zoo archaeologists. With the help of this kind of study, past environment and climatic conditions as well as animal and human behaviore could be well recognized. As in settlement archaeology, man is a major modifier, the bones reflect the signatures of human impact as well as interference. Thus the taphonomy in archaeofaunal assemblages treats livestock or the wild fauna as life assemblage, animals killed for food as death assemblage while the worked bones as use assemblage. Hence this three tier arrangement helps to identify food economy, animals based subsistence and socio-religious practices of inhabitants in the cross section of the faunal assemblage **(Gilbert 1979, Lyeman 1994, Sathe and Badam 1996)**. The goals of taphonomic study are understood subsistence of past humans. To recognize this matter, have to be determined bones depositional systems. There are two categories.

Discussion

Bone deposits and human behavior.

If some of the bones have butchering marks on them, then it is reasonable to suppose that the taxon or taxa represented are an outcome of butchering and food refuse. In this case, the butchering marks are the indication of human agents in the taphonomic history of those remains. Most claims for man's use and modification of bones as tools have been based on cited evidance of either alterd shape or particuler modification such as" flaking", “retouch", “polish", and “abrasion", which were believed to be products of human action **(Binord 1981:37)**. According to Breuil, bones broken by man can be recognized by the “longitudinally' of the broken shafts, whereas bones fractured by animals tend to have “transversely cut sections. For the Longitudinally fractured bone splinters, he proposed that this type of breakage was accomplished by wedging bone tools into exposed bone cylinders, thereby splitting the shafts of long bones longitudinally **(Raymond Dart 1960 :35)**.

Naturally deposited materials.

If the nearly complete and partially articulated skeletons are found, then it can be attributed to burrowing animal such as a hyena. It is naturally deposited and did not form a part of the diet from the human occupation **(R. Layman 1994 :7)**.

Bone modifications by non-human agents.

Carnivores modify bones with gnawing. A very strong animal may be able to accomplish the destruction of large bones, but the tactic of destruction is expected to be essentially like that of a smaller animal addressing a smaller bone. **(Binford 1981: 36)**. This kind of modification can be seen as punch marks. Especially soft (spongy) portions of the bone are affected from such modifications.

Present assemblage.

Every bone fragment was carefully examined for any signs of bone modification. It is a common knowledge that the bone modification can occur due to both human as well as and non human agents. A careful look at the bone modification can give us an idea about the way the faunal material was discarded /deposited. The majority of the faunal material recovered from different layers shows good preservation and very less effect of post

depositional factor. Anyhow, in some cases the bone fragments seemed to have undergone physical movement and trampling. For example, distal and proximal fragments of long bones were in trampled condition. Complete phalanges of large and medium sized mammals are well preserved. Some bones were blackish and some bones were bearing fracture marks. A good amount of bones is with gnawing and cut marks as well as they are charred. Astragulas and some phalanges were modified by human interference.

Human induced marks on the bones.

There are various kinds of marks have been studied at the RGR6 fauna assemblage. Those are as follows Chop, Slice, Fine slice, Point Insertions, Blade Insertion, Scoop, Knick, Skinning, Disarticulation. A general explanation with reference to the point of impact, results of impact, artifact of impact, etc. are being described below with suitable citations from **Lyman (1994)** and **Kris Seetah (1975)**. Butchering and carcass processing activities leave many marks and the bone fragments. Several skeletal fragments predominance of large animal has been found to bear certain cutting and butchering marks. Most of the bones like tibia, humerus, scapula, vertebrae, ribs are showing these cut marks. The classification of bone breakage pattern is followed after **Lyman (1994)**.

Cutting and butchering marks.

(Table 1. bone breakages at RGR 6)

Breakages types	Bones	NIP %
ST	26	13.97%
SW	86	46.23%
Y	14	7.52%
FL	8	4.30%
IP	21	11.29%
SP	13	6.98%
SPR	18	9.67%
TOTAL	186	100%

ST=Stepped or Clumber.

SW= Saw-toothed.

Y= Y shaped

FL= Flaking.

IP= Irregular perpendicular.

SP= smooth perpendicular.

SPR= spiral.

Chopping marks.

These kinds of marks are created by heavy duty tool with a sharp edge such as cleavers. This factor depends on where they occur in the bone. This chop marks usually can be seen on the coral or around the cancellous bones. Generally, when they are present on the cortial surface there is a tendency for the chopping action to leave a smooth surface at the point of impact.

Slice marks.

This mark is effectively characterized by a delineated striation along the bone, with a V cross-section. The length of the cut marks can be relatively short and compact. The depth of the mark, its length, width, placement and number of occurrences at any single location in the bone as well as the portion of implementing used.

Fine Slice marks.

A fine slice is distinguished from a slice mark by the fact that it's made with a sharp bladed implement with a thinner cross section. Similar characteristics evident with a “slice" are also typical of a “fine slice" although the mark will be shallower and thinner.

Point Insertions.

This type of marking indicates that only the tip of the blade was used during the butchery process. Distinguishing this mark from other “slice" and “fine slice" marks depends on recognizing distinctive insertion and exit marks at the start and end of the cut mark.

Blade Insertion.

Blade Insertion indicates a different portion of the knife being used, namely the blade. This type of mark is usually characterized by smooth entry and exit point of the blade.

Scoop.

This type of mark is very distinctive and denotes a blade insertion, but with clearer indications of butchery activity. In this instance the blade has been utilized along the length of bone in order to remove small remnants of meat, or to detach a portion of muscle from a particularly tight into the bone, or if the blade encounters protruding bone architecture.

Knick.

Knick mark is created in a similar manner to the scoop mark, but is generally found in areas where the bone is more complex with a greater degree of architecture. The knick mark is also presented as a consequence of disarticulation. This mark is usually small and differs from the scoop and other blade marks in that it is generally characterized by an abrupt stop.

Skinning.

This activity is generally characterized by cut placement focused around the lower limb extremities and head, with an implement signature indicative of point insertion and fine slice marks. During the operation sequence, skinning generally takes place directly after slaughter, but can occur before or after evisceration.

Disarticulation.

This type of activity pattern evident from the bones indicated that gross disarticulation, of major limb elements or entire muscle groups, resulted from the marks recorded. This was based on a combination of factors, of which the most important was when the particular butchery took place within the operational sequence. Disarticulation marks are generally observed around joint articulation or on the joint surfaces; scapula.

Bone breakage

Bone breaking activity will usually occur at the end of the butchery sequence and may incorporate systematic fracturing of long bone shafts and epiphysis with a cleaver. A, how more impremative are indications of pot-

sizing which is characterized by chopping of larger bone into regularly sized units.

Comments/ Layer	1	2	3	4	5	6	7	8	10	14	**To-tal**	%
Charred bones	8	8	2	2		2	3	4	2	0	**31**	31.31%
Completely charred	0	1	1	0	0	0	0	0	0	0	**2**	2.02%
Charred and vitrified	0	2	0	0	0	0	0	0	1	0	**3**	3.03%
Cut marks	5	2	3	0	2	5	4	3	3	0	**27**	27.27%
Gnawing marks	12	13	1	0	0	2	2	1	3	2	**36**	36.36%
Total	**25**	**26**	**7**	**2**	**2**	**9**	**9**	**8**	**9**	**2**	**99**	100.00%

(bone modification at " RGR 6")

A number of bone fragments found at RGR 6 show charring and butchering, is indicators of food processing and cooking activities **(Chart 02)**. Faunal materials like astragalas, mandible, calcanium, and some of long bones are bearing these charred marks. The degree of charring could be used to separate fragments as slightly charred, completely charred, and charred and calcified. The details and number of this kind of charred bones are illustrated in the table below The maximum charred bones were recorded in layer number 01 and 02. Completely charred bone only 2. Vertified bones.

Bone modification by carnivores.

Bones were found with gnawing marks, left by carnivores. Most of vertebrae spine and ribs show the gnawing marks clearly. Some bones were unfixed and some were fused. The maximum gnawing marks are noticed in layer number 02. It is 13 in number. Some gnawing marks look like punch. The soft areas of bone have been eaten or gnawed.

Bone weathering

It is interesting to find that a large number of skeletal fragments were porous in nature. Many of these were broken probably due to the post depositional factors. Most of bones at RGR 6 show fracture marks. Some obones have turned blackish color, especially mandible and some long bones. Phalanges, astraglus and calcaneum were almost complete.

According to Leyman, there are three factors in weathering stages.

01. Small, compact bones, such as podials and phalanges weather more slowly than other elements of the same skeleton.

02. Bones of different taxa, especially those of different body size, weather at different stages.

03. The less equable the immediate environment (in terms of temperature and moisture fluctuations) of the bone, the faster it should weather. **(Lyman 1994 : 358)**.

Bone modification by humans.

Usually human agencies reported the bone modification at archaeological sites. But sometimes it is very difficult to recognize that modifications were done by whether human or animal. Bone tools, ornaments are reported at RGR 6, which could be clearly identified. Astragalas bones were found almost from every layer which was modified. This bone shows sharp cutting surface, and polished. Probably these bones used for rubbing something like bone tools. Otherwise chopping hard materials or herbal. However, this astragalas was very significant factor in bone assemblage at RGR 6.

Bone tools.

One bone was broken from proximal end and while the other one is pointed. It is a sharp pointed tool. Bone tools are very few in the collection.

The nature and function of worked astragali (ankle bones) at Rakigarhi.

There are seven astragali of cattle in present assemblage which are cut, rubbed and polished on the anterior side. Some of them are broken probably when the bones were still in the process of cutting and polishing. The polished surfaces are very smooth. This highlights a unique feature, seldom observed in Indian materials. So far this feature remains unknown except at Kanmer, another Harappan site in Gujarat (Pankaj Goyal: Personal communication), where a few astragali of cattle have been reported with similar working.

What was the reason behind such an intended exercise remains unexplained. Interestingly it appears to be a feature commonly found at several Chalcolithic settlements in south-east Europe **(Gilmour 1997 and Dandoy 2006)** They reports that this type of bone objects especially made on astragalus were most often used as game pieces, as well as served a ritual function in cultic and funerary contexts **(Koeper & Whitney-Desautels 1999)**. In Mongolia this is reported to have been used as ornaments **(Kardin**

and liev. 2008). **Lewis (1990)** mentions that the astragali which were found from America are ground on the distal and proximal ends, and approximately 20% were modified on the medial surfaces. This astragalus occurs as burial goods in 12 of the 19 Sites in Angolia. There are contextual specimens found in the graves of an adult male at the Angel in southwestern Indiana **(Black 1967)**. Similarly fashioned Astragali have been found from Megiddo in Tomb 251 and belonged to Capra species instead of cattle **(Foster 1986: 317,319)**. Many of the *capra* astragali from Magidde are modified. The Astragalus at the ground on both sides while the other specimen was perforated and the hole filled with copper. Five deer Astragali were found to be heavily worked and polished **(James and Mcgovern, 1993).** In Cyprus the '*capra*' and *Bos indicus* Astragali were both perforated with up to three holes or smoothened on one side, and occasionally filled with lead. Same modification techniques can be seen in Anatolia. At Ugarit such worked Astragali on the basis of the context of its discovery have been argued as used for a game, which is still played at that time in the village of Siria **(Scheffer 1992)**. Recently, an unusual deposit of several Astragali of *ovice aris*, cattle and deer has been discovered in the deposits of Tell of Poduri-Dealul Ghindaru, located in the county of Bacau in eastern Romania **(Bejenaru et al. 2010)**. The excavators believe that such objects found an ultimate destination in a ritual deposit designed to bring good fortune to a new dwelling. However, on the other hand, a contrary interpretation comes for eight bovine Astragali which were polished on the anterior surface and were found in refuse deposits at the same site. **Cavaleriu & Bejenaru (2009)** have argued that the bones were used in the processing of animal hides.

The preparation of Astragalus for making a special object (as seen among various samples world over) leaves behind four main types of modifications such as

1. Cut marks.
2. Shaving down or polishing the sides of the bone.
3. Perforating or partially drilling one or more holes through the bone
4. Filling the hole or attaching to it bronze, copper, iron or lead fragment.

Conclusion

However, as regards Rakhigarhi the function of these worked Astragali and other faunal remains open to further inquiry, especially when the information on its stratigraphical and locational context is not available. Nevertheless, based on the available information on worked Astragali from various sites in the world, it may be argued that these Astragali at Rakhigarhi may help in address, the issues of ritual practices or leisure activities of the people who shaped them with a definite purpose in mind.

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