Chase, Bradley Allen

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B. A. Chase

Butchers, Bones, and Plastic Bags: An Ethnoarchaeological Study of a Specialized Meat Distribution System in the Indian Punjab

Introduction

An archaeological study of butchery, the process by which animals are transformed into socially acceptable food products and distributed to consumers, has enormous potential to contribute to a more complete understanding of the social and economic organization of the prehistoric towns and cities of the Greater Indus Valley. Although faunal remains, the primary data associated with this important subsistence technology, are ubiquitous at archaeological sites in the region, their interpretation in terms of the social behaviours associated with meat production and distribution is only possible through the development and testing of models linking archaeological remains to human behaviour. It was towards the development of such models that ethnoarchaeological research was conducted in Bathinda, Punjab, during the winter and spring months of 2002 and 2003. During this period, the material correlates of all stages of sheep and goat processing and distribution were documented. In this contribution, I describe the data obtained from this research along with some preliminary methodological conclusions.

An Overview of Bathinda

Bathinda, an important regional centre in the Indian Punjab with a population of approximately 220,000 (Census of India 2001), was chosen as a study location for a number of reasons. First, Bathinda's geographical situation is similar to Harappa and many of the other Indus Civilization cities and regional centres in the upper plains of the Greater Indus river system. Although contemporary pastoral production and distribution in northern India is firmly embedded in the market economy of a modern nation-state (e. g., Agrawal 1998; Robbins 1999), the majority of the animals consumed in Bathinda are, in fact, produced locally and brought into town on the hoof. Second, because butchery in Bathinda is conducted exclusively by hand and with very little use of refrigeration or mechanized transport, it is potentially more analogous to 3rd millennium urban butchery than might be the case in larger urban centres. Finally, although the population of Bathinda is considerably larger than most population estimates for even the largest Indus cities, meat-eaters actually comprise a relatively small portion of the population. Although no statistics are available to support this observation, and the actual proportion of meat-eaters in the Indus cities is unknown, it is reasonable to suggest that the number of animals processed each day may be of an order of magnitude similar to that which took place in the larger Indus cities.

The most significant difference between the contemporary situation in Bathinda and that of the towns and cities of the Indus Civilization is that today only sheep, goats, pigs, and chickens are butchered. While cattle were a major contribution to the meat economy of the Indus Civilization (Meadow 1989, 1993), in Bathinda the butchery of cattle and buffalo is forbidden by local law and to the best of my knowledge is *not* practised clandestinely. Since fowl and pigs seem to be rather minor contributors to the faunal assemblage at Harappa, the remainder of this paper deals exclusively with the butchery of sheep and goats.

The most intensive fieldwork was conducted in a neighbourhood here referred to as PF (fig. 1). PF is located on the outskirts of town between two of the six rail lines that converge approximately 1 km north of the station. As recently as the 1960's this neighbourhood was still relatively sparsely occupied with the exception of the slaughterhouse and a now defunct bone processing plant. The meat shops in this neighbourhood are mostly small portable shacks operated by Muslims although two of the butchers operate out of actual storefronts across the street. Only one shop is operated by

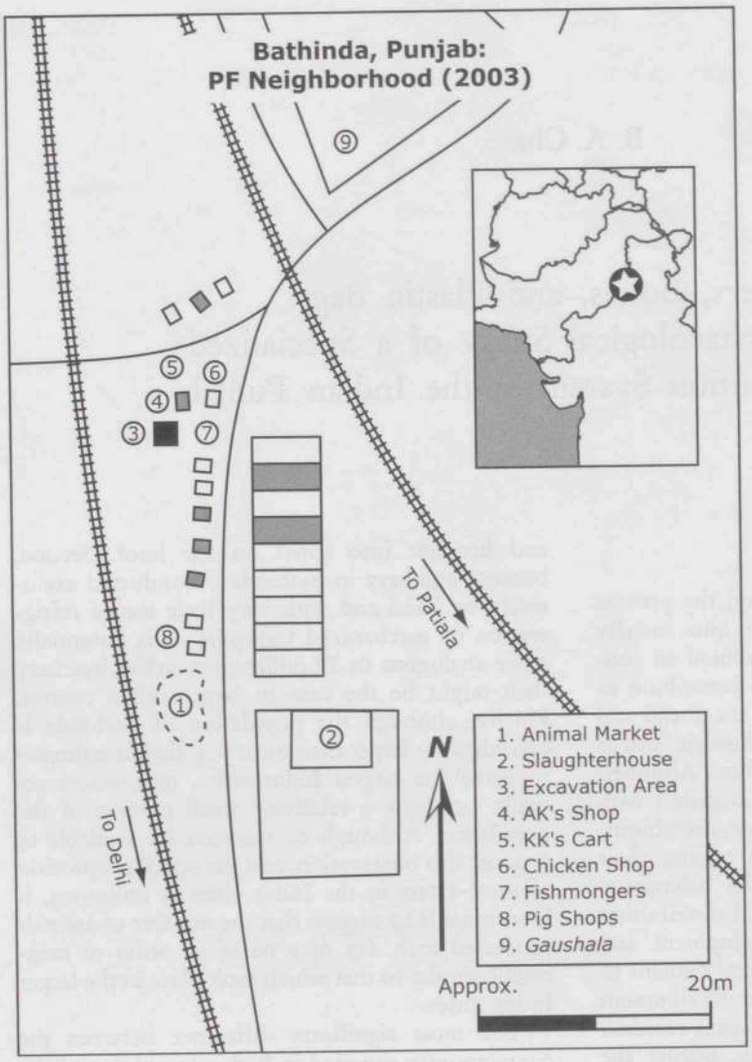

Fig. 1. A sketch map of PF neighbourhood in Bathinda highlighting the locations mentioned in the text. Grey-shaded buildings are shops selling primarily sheep and goat meat.

a non-Muslim in this neighbourhood. Several of the sheep and goat butchers also sell chickens and there are several specialist chicken and pig shops nearby.

The Technology of Butchery in Bathinda

Butchery is a process by which animals are procured, transformed into socially acceptable food items, distributed, consumed, and discarded, not unlike the way in which other raw materials are transformed into cultural artefacts. Like other technological processes studied by archaeologists, butchery takes place in stages, and it is important to recognize that these stages are undertaken by human agents, each situated in his or her own particular set of social networks that may affect the way in which a given operation is carried out (Dobres 2000). The documentation of the deposition of the physical remains resultant from each stage thus allows for the archaeological reconstruction of a given technology (Vidale/Kenoyer/Bhan 1992). The following presentation is therefore structured according to the *chaîne opératoire* by which animals are processed with an emphasis on the variations that may take place at different stages as they relate to the social identity of either the technician or the consumer for whom he is working.

Animal Procurement

The first stage in the butchery process is the procurement of the animals. In Bathinda this takes place daily as traders bring mixed herds of sheep and goats that they have acquired from nearby villages and specialist herders to an *ad hoc* animal market opposite the municipal slaughterhouse (fig. 1, 1). Here shopkeepers buy their animals and take them to the slaughterhouse where they are taxed and slaughtered (fig. 1, 2). During June of 2002, 52 sheep and goats, on average, were slaugh-

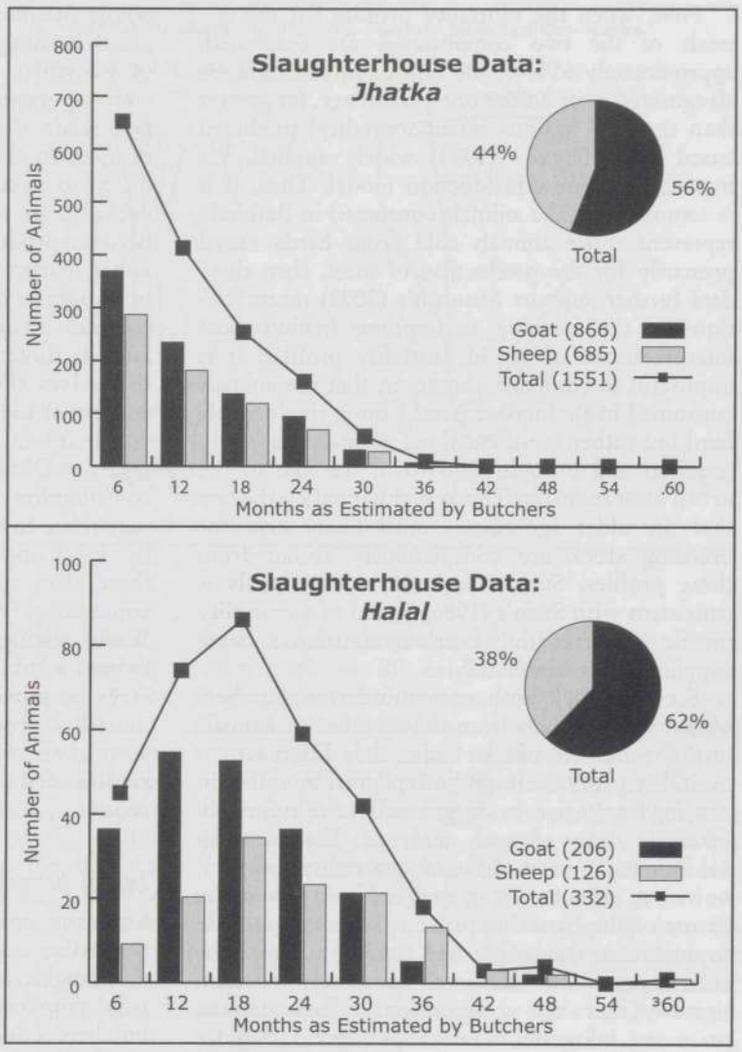

Fig. 2. Age data collected from the slaughterhouse from 23 May 2002 to 3 July 2002.

tered each day. While Muslim shopkeepers generally buy only one or two animals that they will slaughter themselves according to orthodox *halal* practice, the fewer Sikh and Hindu shopkeepers generally buy up to 10–15 animals each day that they will pay to have processed by the workers in the slaughterhouse according to local interpretations of *jhatka* practice.

It is at this stage, and this stage only, that city authorities exert direct control over the industry through the taxation of animals passing into the municipal slaughterhouse. This fact was taken advantage of by this investigator with the goal of constructing a profile of the ages at which animals were being slaughtered. For 36 days out of six weeks (no meat is sold on Tuesdays) beginning the last week of May 2002, the clerk at the slaughterhouse recorded the age, sex, and technique of slaughter *(halal* or *jhatka)* for each animal that passed through the slaughterhouse. For aging, shopkeepers generally rely upon the eruption of incisors, which have long periods of eruption extending into the into the fourth year (Deniz/Payne 1982), as well as size, weight, and time of year for age estimations. It is therefore likely that there is some degree of error in the ages of animals as given to the clerk – especially beyond four years of age, when all permanent incisors have erupted and when significant size increase has ceased. In any case, it is clear that *jhatka* butchers process many more animals each day than *halal* butchers (Muslims are an extreme minority in Bathinda) despite the fact that *halal* shops outnumber *jhatka* shops in Bathinda nearly 3:1. Although the ratio of sheep to goat is relatively consistent between the two, the ages at which animals are slaughtered vary considerably: the greatest proportion of the animals slaughtered by *jhatka* butchers during the study period were less than one year old whereas the greatest proportion of the animals slaughtered by *halal* butchers were around 18 months old (fig. 2). The significance of these data is twofold:

First, when the mortality profiles for the animals of the two communities are combined, approximately 63% of the caprids in Bathinda are slaughtered at or before one year of age, far greater than the 18% (minus infant mortality) predicted based upon Payne's (1973) widely applied, yet hypothetical, meat production model. Thus, if it is assumed that the animals consumed in Bathinda represent those animals sold from herds raised primarily for the production of meat, then these data further support Munson's (2000) recent critique of the working assumptions behind most interpretations of caprid mortality profiles. It is important to recognize, however, that the animals consumed in Bathinda are *not* from a single viable herd but rather represent those animals selectively acquired and brought into town for sale to the urban meat industry. This is highlighted by the fact that the older age classes most likely kept for breeding stock are conspicuously absent from these profiles. Such a lack of older animals is consistent with Stein's (1986) model of a mortality profile characteristic of urban consumers being supplied by a hinterland.

Second, since both communities of butchers obtain their animals from the same set of animals brought into town for sale, the difference in mortality profiles cannot be explained by different herding strategies as is generally the approach taken in many faunal analyses. The meaning behind these very different mortality profiles, however, remains an open question. Given the nature of the bartering process, it was impossible to document the weight and actual price paid for each animal. In numerous documented sales, however, there was no significant difference in the price per kilogram between younger and older animals. Furthermore, sheep and goat meat from all ages of animal sells for a uniform price. Thus, it seems that these documented preferences are exactly what they appear to be: generally unconscious predispositions. This is supported by the fact that although a differential in the age of consumption between communities was widely acknowledged to exist, there was no corresponding agreement as to the reason why beyond the stated observation that the age of animals generally consumed by the informant's community were somehow "better." Preferences of these sorts are an important feature of practice theory (Bourdieu 1977) as it has been applied in recent archaeological studies of technology (e. g., Dobres 2000; Hegmon 1998) and social identity (e. g., Emberling 1997; Jones 1997). These data support the notion that such an approach may very well lead to increasingly nuanced interpretations of faunal remains in urban contexts.

Although these data are much finer in resolution than those available from most archaeological studies, they have important implications for the interpretation of caprid mortality profiles. While whole-site mortality profiles may very well reflect either herding strategies or the import or export of particular age-classes, intra-site variability in contemporaneous archaeological localities may in fact relate to the preferences of the consumers resident in those areas. Such a situation is most likely to occur in the presence of a system of exchange or redistribution in which the relations between producers and consumers are mediated by either market or other redistributive mechanisms in an *indirect* distribution system structurally more complex than one in which the producers of animals directly interact with consumers (or are themselves the consumers) (Zeder 1991). In the context of the Indus Civilization similar intra-site variability in caprid mortality profiles has been noted at Dholavira by Patel (1997). Although the consumption of particular age-classes of animal may relate to economic stratification as interpreted by Patel and others (e. g., Wattenmaker 1987), these data suggest that it may also relate to community identity, as is the case in Bathinda. While distinguishing between these two intertwined sources of social distinction may not always be possible, the identification of distinctive mortality profiles in contemporaneous areas can serve as an important point of reference for further studies of the social organization of Indus urban centres.

Initial Slaughter and Skinning

Once the animals have been purchased and taxed, processing begins in the slaughterhouse. Although the slaughterhouse is not roofed, a wall divides it: *halal* shopkeepers work on one side and the *jhatka* butchers work on the other. As mentioned above, on the *halal* side of the wall, individual butcher-shopkeepers slaughter and dress their own animals whereas on the *jhatka* side shopkeepers pay slaughterhouse workers to prepare their animals. The first step in the process is initial slaughter. It is at this point that *the* major difference between *halal* and *jhatka* techniques is seen. *Halal* butchers slit the throat with a knife from below, break the neck, and wait for the blood to drain before removing the head. On the other side of the wall, *jhatka* butchers remove the head immediately, ideally in one continuous sawing motion. While traditionally (and in other *jhatka* slaughterhouses in the region) *jhatka* butchers use a sword from above, in Bathinda, they use a knife from below – very quickly. Thus while one would expect a major difference in the type of the cut-marks produced between these two butchery techniques on the bones of the head and neck if a sword were used, in Bathinda there is very little difference. The removal of the head by both techniques may lead to the production of multiple transverse cut-marks across the occipital condyles of the skull and the cranial articular surface of the atlas.

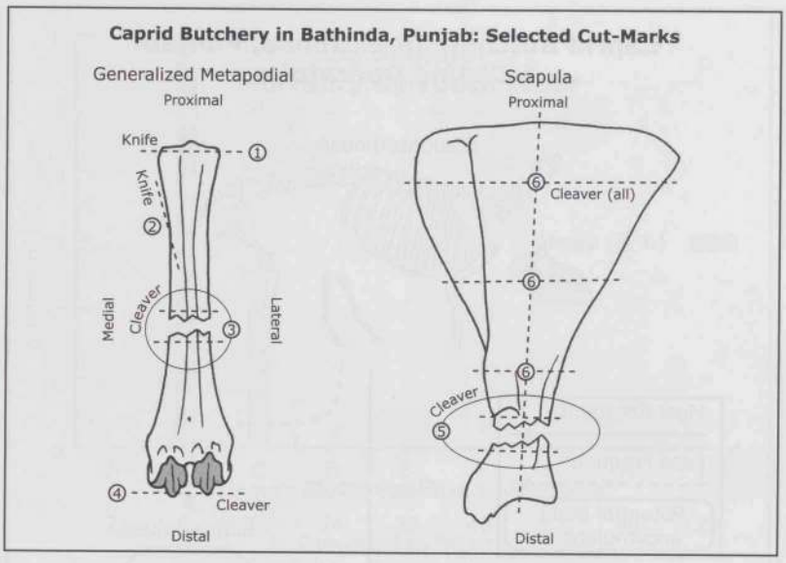

Fig. 3. Selected cut-marks mentioned in the text. Element drawings modified from Hillson (1992).

The next stage in the processing of the animals involves skinning and the removal of the entrails. The first step in this process is the removal of the front feet at the proximal metacarpals with the skin intact and with cut-marks often produced on the proximal articulation (fig. 3, 1). Next, a slit is made in the hide along the metatarsals, often producing cut-marks along the medial side of the shafts (fig. 3, 2). From a sitting position, the butcher places his toes into the slits, holding the rear legs of the animal open, and cuts the skin between the two slits. The skin is then simply peeled off of the carcass, with no further use of tools, resulting in an inside-out, intact hide. The rear feet are then disarticulated at the tarsal-metatarsal joint often leaving cut-marks on the proximal articulation of the metatarsals similar to those produced on the metacarpals (fig. 3, 1). Unlike the removal of the front feet, however, the tendons are left intact so that the animal can be hung from them during the subsequent removal of the entrails. No bones are deposited at the slaughterhouse.

Sale from the Shops

Shopkeepers then take the dressed carcasses, heads, and feet to their shops mostly clustered in 3–4 distinct areas around town, although PF neighbourhood is home to the largest concentration of shops (e. g., fig. 1 – grey shaded boxes). Many of these shops are simply small portable stalls that encroach into commercial areas and are operated by small-scale butchers who only sell 1–2 animals each day. The heads and feet are sold either whole or prepared according to the customers' wishes. In the latter case, cut-marks may be produced on the metapodials and the crania similar to those described below and the mandible is generally discarded as trash (fig. 4, 1), often directly deposited near the shop, especially if the shop is in an area, such as PF neighbourhood, that is not regularly serviced by sweepers. The remainder of the meat is chopped into nearly bite-sized pieces with a heavy cleaver and sold to consumers. Other than the mandible, the only bone that is regularly deposited near the shops is the proximal scapula, from which the meat may be easily removed following the chopping off of the distal articulation with the cleaver (fig. 3, 5). If this procedure is not undertaken, the entire scapula may be chopped into pieces and sent away with the meat (fig. 3, 6). Although the inclusion of the proximal scapula with the meat clearly adds to the weight of the package, the choice of cutting procedure is generally left to the customer. Although not widely agreed upon, there were certainly a significant number of Muslim customers who felt that cooking the scapula was not properly according to *halal* dietary guidelines, suggesting that the distribution of the proximal scapula with transverse chopping-marks might be an indicator of community identity were city-wide excavations to be undertaken.

Following consumption, the small pieces of bone are dumped into the street where they are collected by sweepers who carry them off in carts for disposal in neighbourhood dumps (fig. 4, 2) from which they may be further dispersed by a variety of post-depositional processes such as marauding dogs and pigs or later construction activities.

Soup Preparation

At the slaughterhouse, before the dressed carcasses are taken to the shops, many of the heads and feet are purchased wholesale by individuals who prepare them into soup for sale in the evenings

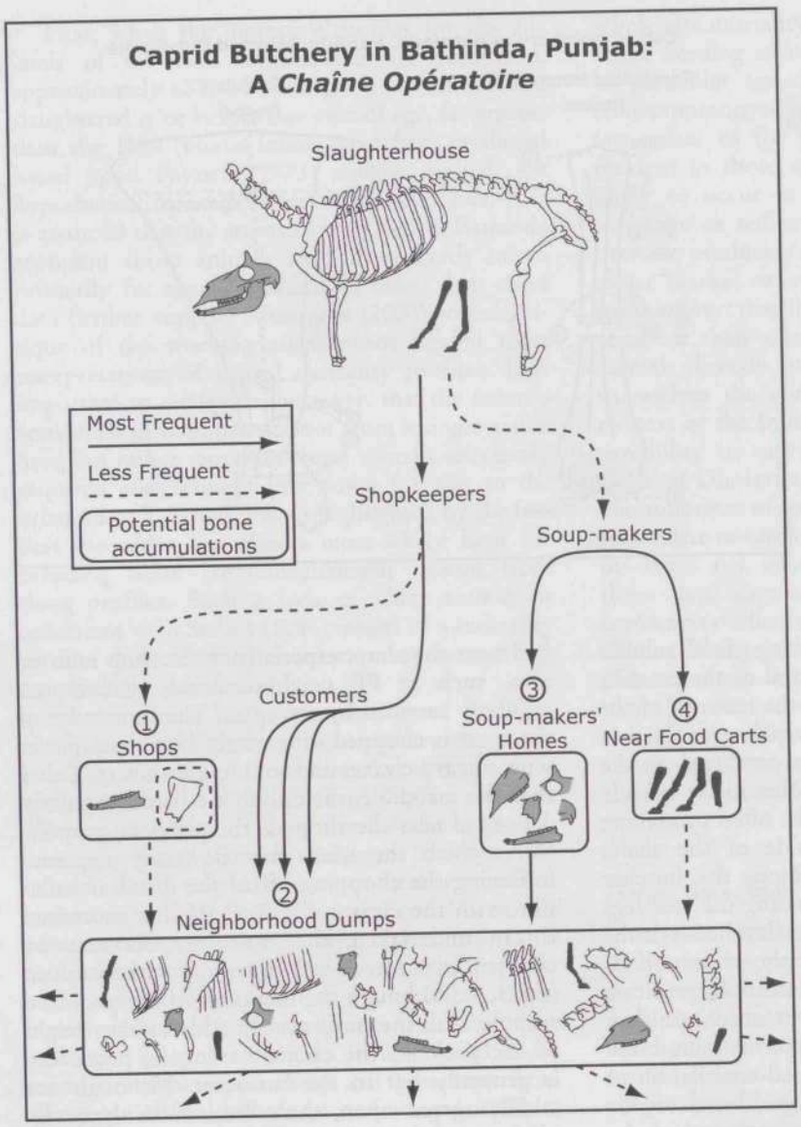

Fig. 4. The caprid butchery process in Bathinda. Schematic skeleton modified from Lyman (1987).

out of their food-carts. These soup-makers generally buy either *halal* or *jhatka* each day, although they do not necessarily buy one or the other type of meat based upon *their own* social identity. Customer preference is important, but so are (idiosyncratic) microeconomic calculations. Each day JS (Sikh), for example, bought, on average, 2–3 small (younger) *jhatka*-cut head and feet sets, which sell for less than larger sets, with the goal of producing the most soup for the least cash outlay. KK (Hindu), on the other hand, generally purchased one large (older) *halal* head and feet set on the assumption he can produce more soup from one set of large head and feet (supplemented by stomach) than by purchasing several smaller sets of heads and feet (fig. 5). As was the case with the procurement of animals for slaughter by butchers belonging to different communities, this again highlights the fact that mortality profiles in complex, *indirect* distribution systems may not relate to production strategies as much as to the preferences of the consumers, or in this case, the strategies of the agents who prepare food for consumption.

The soup-makers take the heads and feet to their homes where they remove the undesirable portions including the mandible, upper jaw, and nasal cavities, which are discarded locally, eventually ending up in the neighbourhood dumps (fig. 4, 3). This leads to variety of slicing and chopping cut-marks produced with a heavy cleaver on the cranium as well as multiple shallow cuts along the lateral surface of the ascending ramus parallel to the tooth row. The metapodials are chopped in half with a heavy cleaver to facilitate marrow extraction and the braincase is chopped into pieces (fig. 3, 3–4). Unlike the cranial fragments, the metapodials are highly desirable and are taken to commercial areas in the evening and are sold along with the brain and broth (e. g., fig. 1, 5).

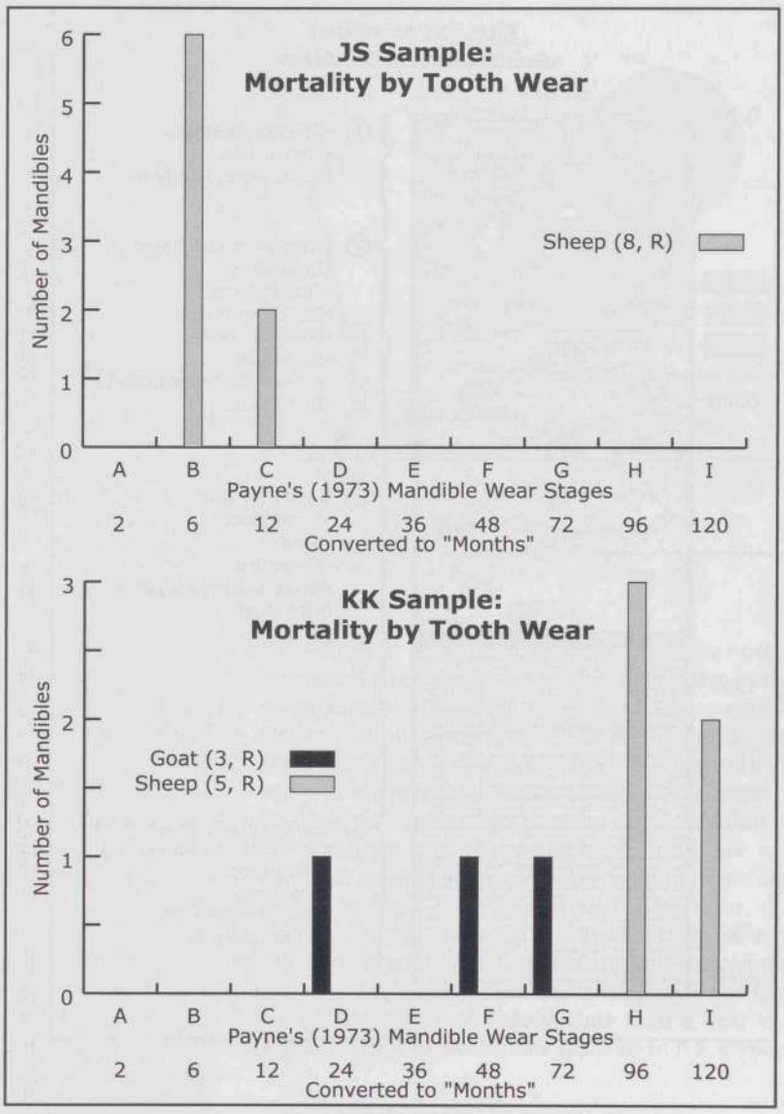

Fig. 5. A sample of animals processed by two soup-makers who operate in different neighbourhoods.

The customers, when they are finished with them, generally toss them aside where they may become incorporated into the archaeological record (fig. 4, 4).

While skeletal elements of the head and feet are often thought of as primary butchery waste, which they may be, they are also nutritious, and in some cases, highly desirable foods that are seen as worth the extra effort required to process them (e. g. Bowen 1992; Grantham 2000). Archaeologically, the difficulty lies in discriminating primary butchery waste from processed food waste that may, in fact, be the result of a specialized marketing activity, as is the case in Bathinda. One way in which the products of these two very different stages of the *chaîne opératoire* may be identified is through an examination of the nature and location of the different types of cut-marks on the bones in a given assemblage. The metapodials collected from soup-makers, for example, may receive cut-marks from knives during their initial removal or skinning at the slaughterhouse and may later receive a different set of cut-marks from the soup-maker using a cleaver during the preparation of soup.

In the above description of the butchery process, the locations of selected cut-marks have been noted, but the frequency of their appearance as it may relate to the tool used, the location of the cut-mark on bones from different ages of animals, or the craft organization of the agents involved has not been quantified. In preliminary analyses, there are indications that with larger samples it should be possible to associate the relative frequency of different types of cut-marks with one or more of these variables. The bones collected from the soup-makers contain a wide variety of cut-marks that are potentially affected by all of these variables. Collections are continuing to increase sample size in order to refine these analyses.

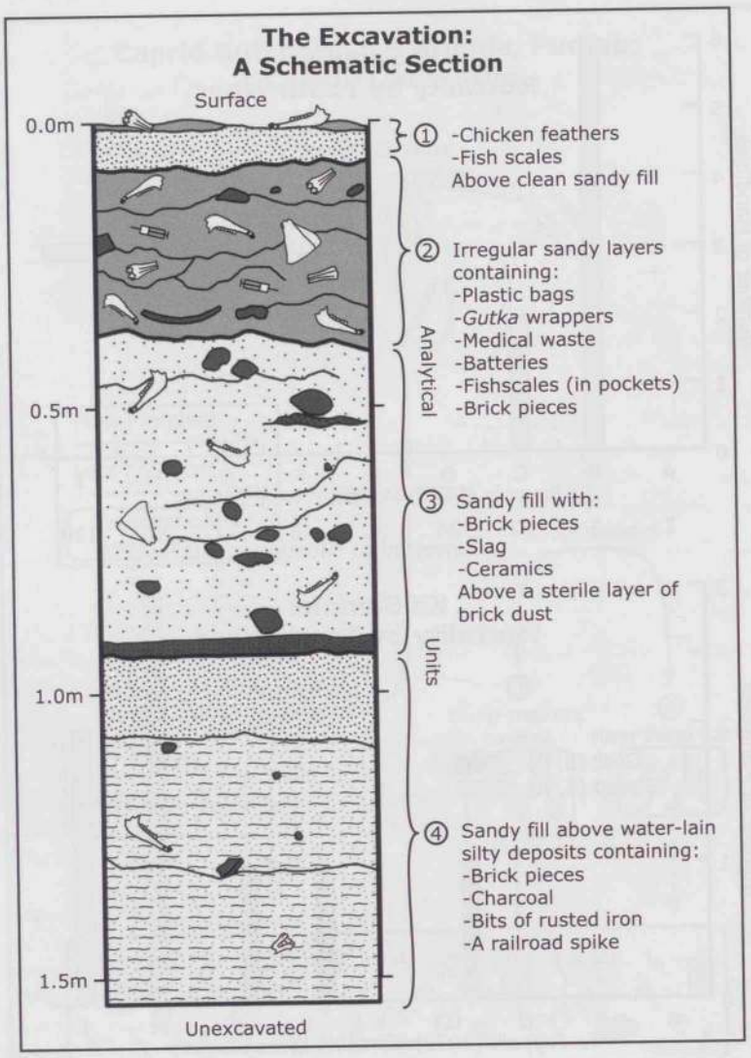

Fig. 6. A schematic section of the excavation discussed in the text.

An Excavation

For ethnoarchaeology to truly move beyond the descriptive mode, it is imperative that ethnoarchaeological studies collect material data that can be directly compared with excavated data. In an effort to understand how the butchery process described above might be represented in the archaeological record, a small 2 × 2 m excavation extending approximately 1.5 m below ground surface was undertaken behind a row of small butcher shops adjacent to a shallow drainage that runs parallel to the railroad tracks. The area is located behind AK's shop and near where KK operates his food-cart (fig. 1, 3–5) and was chosen pragmatically as an area where a high density of bones was likely to be recovered as indicated by a scatters of bones present on the surface in the vicinity. At the time of study the area was covered with several centimetres of chicken feathers from the nearby chicken shops and fish scales from the fishmongers who routinely set up shop in the evenings (fig. 1, 6–7). The area was also wet due to the presence of a nearby hand-pump well. Upon excavation, it was clear that cultural debris continued at least 1.5 m below the present ground surface and that there was clear stratigraphy and systematic change in the artefacts recovered (fig. 6).

Age at slaughter

The first objective behind the excavation was to collect a large sample of mandibles and determine how the animals butchered by AK (Muslim) since the early 1980s, when he set up shop in that location, would compare with the *halal* profile as recorded at the slaughterhouse over a relatively short period. For the sake of comparability with other studies, mortality profiles were constructed using the recording system and calculation method presented by Payne (1973) on either right or left mandibles, whichever was more abundant for a given species or analytical unit. To ensure that multiple fragments of the same mandible were not

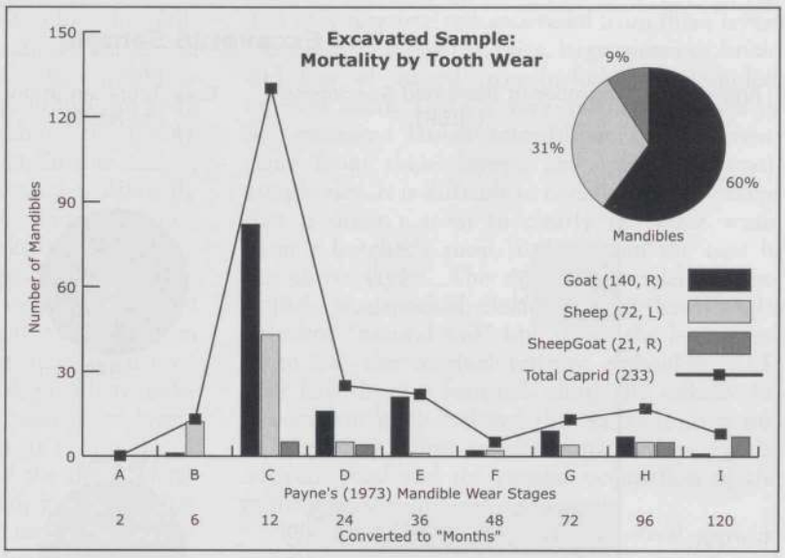

Fig. 7. An age profile of the mandibles recovered from the excavation.

counted more than once, only mandible fragments containing fourth premolars were included. For reasons that are discussed below, loose fourth premolars were also included. The distinction between sheep and goat mandibles was made following both Payne's (1985) guidelines for mandibles with deciduous molars and Halstead/Collins/Isaakidou's (2002) recent guidelines for mandibles with permanent molars. The latter guidelines were nearly always consistent with the former when both deciduous and permanent molars were present in a single mandible. The infamous sheep-goat category, however, was unfortunately still required.

The initial expectation of high densities of bone, especially fragmentary mandibles, was met. The age pattern revealed by these mandibles, removed at the request of AK's customers and discarded behind his shop, roughly parallel the *halal* profile (fig. 7 *cf.* fig. 2). The greatest proportion of the mandibles deposited behind AK's shop is composed of those around 12 months old rather than 18 months old as recorded for *halal* butchers at the slaughterhouse. While this may simply reflect AK's choice of animals, it may also relate to the fact that the relationship between mandible wear stages and actual age in months is problematic and may vary according to the breed, sex, and the fodder consumed by the animals (Deniz/Payne 1982; Moran/O'Connor 1994). Until further studies of the specific breeds of caprids raised in the region around Bathinda are conducted, the conversion of wear stages to months must remain a gross approximation.

The most striking characteristic of the age profile constructed from the mandibles recovered from the excavation, and the one that most clearly distinguishes it from the *jhatka* profile, however, is the relative paucity of animals less than one year old. Recent experiments with domestic dogs, however, have demonstrated that mandibles in the youngest age classes are also the most susceptible to destruction by carnivore gnawing in which the mandible is crushed and the teeth fall out and are often subsequently ignored (Munson/Garniewicz 2003). This leads to severe under-representation of the youngest age classes if loose teeth are not included in the construction of mortality profiles. Including loose teeth in this study, however, did not change the shape of the mortality profile to any significant degree suggesting that carnivore action is probably *not* an explanation for the lack of representation of animals less than a year old in the sample of mandibles from near AK's shop.

Taxa and Element Representation

Another major finding that emerged from the excavation was that there are clear changes through time in the relative proportions of different animal taxa as well as caprid skeletal elements present (fig. 8). These changes are clear and correlate to changes in the function of PF neighbourhood.

Analytical unit 1 was a surface accumulation of chicken feathers, fish scales, and commercial trash underlain by a clean sandy fill layer that had been intentionally deposited sometime in the last few years. Analytical unit 2 was a series of irregular layers of mixed commercial trash similar to that on the surface and densely packed with plastic bags most likely originating from the nearby shops that had been built during 1989–90. Approximately 90% of the excavated assemblage came from analytical units 1 and 2. Sheep and goat bones make up the vast majority of the assemblage from analytical units 1 and 2, with the remainder being portions of the head, fins, spines, and otoliths of local riverine catfish as sold by the nearby fish-

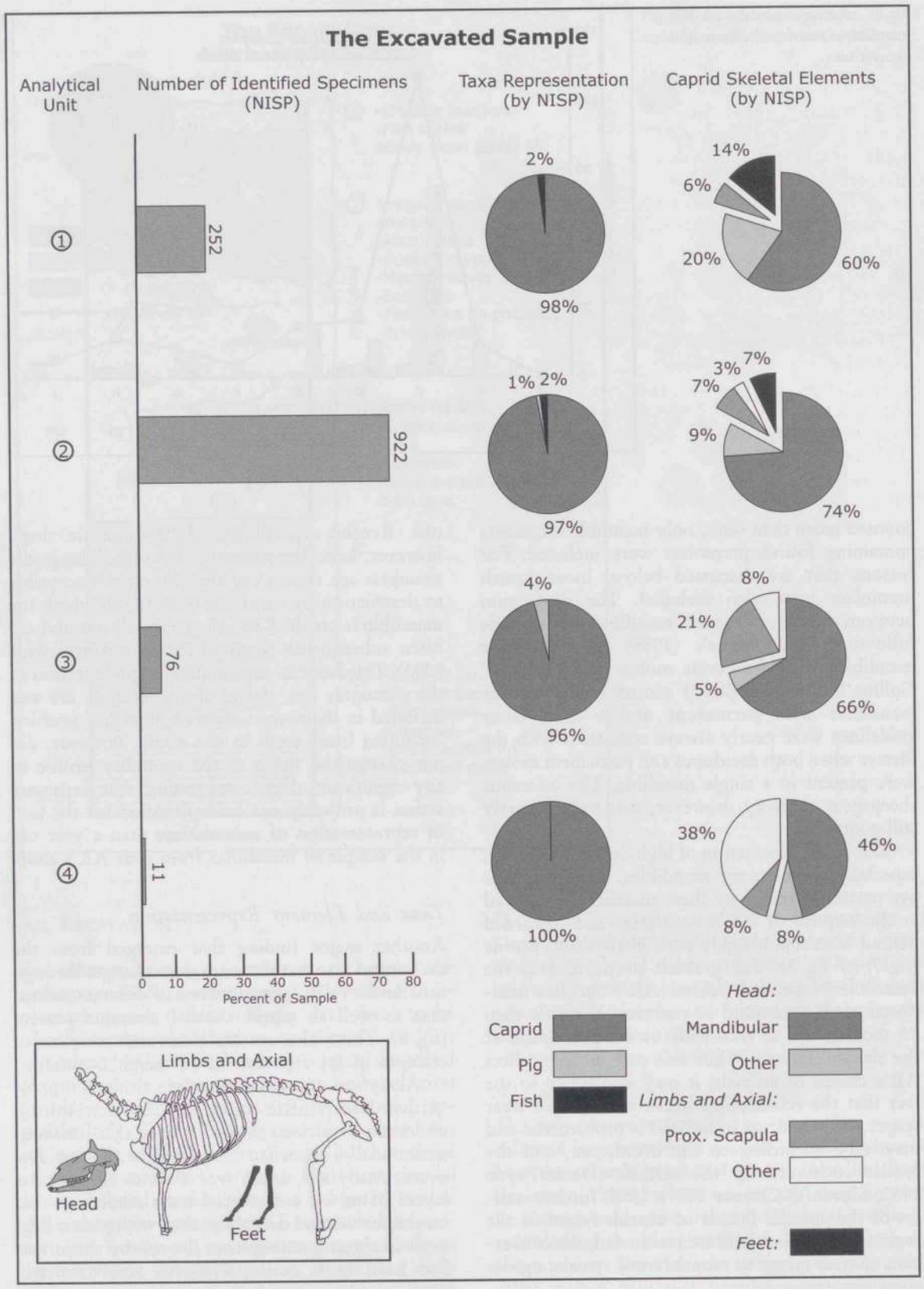

Fig. 8. A summary of the faunal assemblage recovered from the excavation. For clarity, taxa categories representing less than 1% of the total sample (chicken and indeterminate mammal) were excluded.

mongers in the evenings (identifications by William Belcher, personal communication). The caprid skeletal elements present are those that would be expected as waste from a butcher's shop and from a food-cart of the type described above (fig. 4, 1. 4). It is important to emphasize that, in this case, it is likely that these two sets of bones are actually from mutually exclusive sets of animals. As discussed above, KK, who has worked in his current location for over 8 years, specifically chooses the largest (and thus generally the oldest) heads and feet available for his soup whereas AK focuses on animals that are around one year old. This is seen in the excavated faunal assemblage where 64% (143 of 225) of the mandibles from these layers have tooth wear that places them at 12 months or less, whereas 94% (15 of 16) of the distal metacarpals and metatarsals are fused, a process that doesn't start until at least 15 months (Moran/O'Connor 1994). Discrepancies between mortality profiles constructed on the basis of tooth wear and epiphyseal fusion have been interpreted in previous studies as representing different pathways of deposition for cranial and carcass portions (e. g., Maltby 1982). This is certainly an appropriate interpretation in this case where it is known that the (young) mandibles are most likely refuse from AK's shop whereas the corresponding metapodials have been sent away with his customers. Conversely, the (older) metapodials have been brought into the area by KK and the corresponding mandibles have been deposited near his house in another neighbourhood.

The next half-meter, designated analytical unit 3, was composed of irregular layers of relatively clean fill alternating with back-stained water-lain laminations. Commercial trash, including plastic bags, was absent from these layers and was replaced by some ceramics and slag of the type produced by the small clay lined metal cylinders that continue to be widely used in Bathinda for the burning of either cow dung or coal for cooking and heating. The bones in the excavated assemblage from these layers are typical of those discarded from butcher shops, but waste bones from food-carts and fishmongers are entirely absent. A reasonable interpretation of these layers is that they were a dumping area from a time when the area was more residential in character although clearly supporting at least one neighbourhood butcher. This is supported by the fact that AK has worked in that location nearly 10 years prior to the construction of the shops.

Beneath a thin sterile layer of brick dust overlying a thicker layer of nearly equally sterile sandy fill, the final half-meter of the excavation, designated analytical unit 4, was composed of laminated layers of relatively clean, green- to black-stained silty deposits. These layers are most likely the result of periodic standing water in the then low-lying drainage at the edge of the tracks. The very few artefacts recovered from these layers were mostly a few ceramics, large pieces of brick, and bits of rusted iron including a complete railroad spike. Only a very small percentage of the excavated faunal assemblage (11 specimens) came from these layers, and given the small sample size, it is difficult to conclude much except that it doesn't seem to clearly represent waste from a butcher's shop, as had been the case in the above layers. The excavation ended on extremely hard-packed, clean sediment that is probably not "natural soil" but rather the bottom of what was the original railway embankment. It may have been a footpath along the railway (as is common further down the tracks leading out of the city) prior to the construction of the adjacent road and the regular occupation of the immediate vicinity.

While the above patterns of skeletal element representation through time are provocative, dogs and pigs are ubiquitous in the neighbourhood, and it is therefore necessary to evaluate their role as taphonomic agents. Although fewer than 1% of the bones in the excavated assemblage had evidence of carnivore gnawing on them, it is nonetheless clear that carnivores had regular access to the bones prior to their deposition. In analytical units 1 and 2, for example, in which metapodials fragments comprise a significant portion of the assemblage, phalanges, which should be at least as abundant, are almost completely absent, suggesting that they were most likely swallowed whole and subsequently carried away. Furthermore, it is especially important in this case to evaluate the potential biasing role of carnivore agents because the largest proportion of the identified bones in the excavated assemblage are mandibles and metapodials. These bones are among the densest in the skeleton and have been shown to remain identifiable even in faunal assemblages that have been heavily affected by carnivores, leading to their "over-representation" when shaft fragments are not identified and included in analyses (Marean/Frey 1997). Of the 1263 bone fragments recovered from this excavation, however, only 8% (104) were shaft fragments and of these, 94% (98) were identifiable to element. Thus, in this case, although carnivores certainly had access to the bones it seems that they did *not* have a significant biasing effect on the identification of the bones included in this analysis. While they may have altered the relative representation of particular elements, clear patterning remains.

Apart from the changes through time in the representation of animal taxa and skeletal elements described above, these data suggest that, even in the presence of carnivores and construction activities, there may actually be very little movement of bones from their initial location of deposition in dump contexts such as the excavation area. Generalized interpretations of animal utilization in

Bathinda *cannot* therefore be drawn from the faunal assemblage excavated from this small area. There is a chicken shop immediately adjacent to the excavation area (fig. 1, 6), yet less than 1% of the assemblage (3 bone fragments) was identified as chicken. This is because in chicken butchery as conducted in Bathinda, all parts of the bird are removed from the location of slaughter and sale. Similarly, there are several pig shops just down the street (fig. 1, 8) and although mandibles are regularly discarded in the vicinity, less than 1% of the total assemblage was identified as pig. Furthermore, there is a *gaushala* (a home for old and wayward cattle) just up the street (fig. 1, 9) in the opposite direction and horses are a regular sight – yet not a single bone from either of these animals was identified.

Discussion and Conclusions

While it is extremely unlikely that there were *halal* or *jhatka* butchers at Harappa or any of the other cities of the Indus Civilization, this study nonetheless has provided a useful data set that can serve as a baseline in future interpretations of Harappan faunal remains. The research has demonstrated that while whole-site mortality profiles may be informative of either herding strategies or the gross import or export of selected age-classes, intra-site variability within these overarching patterns potentially can provide a wealth of information on economic and social organization. The work has also demonstrated that cut-mark patterning can serve as a useful tool for the reconstruction of the *chaîne opératoire* of butchery and for the distinction of waste products from different stages of the process. Finally, the study has demonstrated that, although analyses of the relative abundance of animal taxa and skeletal elements from modestly-sized faunal assemblages recovered from restricted areas cannot speak to site-wide patterns of animal utilization, they may, in fact, provide extremely high-resolution information regarding the changes in the function of a given area. In conjunction with detailed excavation data that can serve as a guide to the scale of interpretation appropriate to a given assemblage of animal bones, these conclusions will serve as important principles that will guide in the problem-oriented sampling and analysis of faunal remains from archaeological sites in the Greater Indus Valley.

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