



Original Research Paper

Faunal Remains in Mature Harappan Mortuary Contexts: A Zooarchaeological Review and Synthesis (c. 2600–1900 BCE)

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Abstract

Zooarchaeological research on the Indus Civilisation has largely focused on faunal assemblages from habitation contexts, providing important insights into animal husbandry, subsistence, dairying, traction, and butchery practices. In contrast, animal remains from mortuary contexts have received comparatively limited attention. This paper reviews and synthesises the available evidence for faunal remains associated with Mature Harappan (c. 2600–1900 BCE) mortuary contexts across the Indus core region of Sindh and Punjab, Gujarat, and the Ghaggar–Hakra region of Haryana. Mortuary evidence is evaluated alongside the better-documented zooarchaeological record from settlement contexts to explore possible relationships between everyday animal exploitation and funerary practice. The review shows that animal remains recur, although unevenly, within Harappan mortuary landscapes, but their interpretation is constrained by inconsistent recovery, limited contextual documentation, and the scarcity of detailed taxonomic and taphonomic analyses. Rather than assigning a single function to these remains, the paper considers several overlapping possibilities, including food provisioning for the deceased, funerary consumption or feasting, deliberate ritual deposition, and the expression of social differentiation. These interpretations remain provisional because burial-specific faunal datasets are still limited. By bringing together previously scattered evidence, this review identifies mortuary zooarchaeology as an underdeveloped dimension of Harappan research and highlights the need for systematic recovery, species-level identification, skeletal-element and taphonomic analysis, and precise contextual recording. Such approaches can substantially improve understanding of animals, ritual practice, and social differentiation within the Indus Civilisation.

Keywords: Indus Civilisation; Mature Harappan; zooarchaeology; mortuary archaeology; faunal remains; funerary practices; human–animal relationships; South Asia

1. Introduction

Animals occupied multiple and often overlapping positions within past human societies. They provided food, labour and raw materials, but were also incorporated into systems of representation, social identity, ritual practice and understandings of the natural and supernatural worlds. Archaeologically, however, the presence of animal remains does not in itself reveal which of these relationships is represented. The significance of faunal material depends fundamentally upon its context: the same skeletal element may derive from food preparation, refuse disposal, craft activity, deliberate deposition or ritual practice. As Leroi-Gourhan (1972) observed in an early discussion of animals in archaeology, the archaeological problem extends beyond identifying the animal to understanding the human actions that produced its archaeological context. This distinction becomes especially important in mortuary archaeology, where animal remains found in association with the dead

may invite interpretations of sacrifice or offering but may also derive from funerary meals, food provisioning, secondary deposition or other activities associated with burial. This interpretive problem is particularly relevant to the Indus, or Harappan, Civilisation, which developed across the environmentally diverse landscapes of present-day Pakistan and north-western India between approximately 3300 and 1300 BCE. Its period of greatest urban expansion, conventionally termed the Mature Harappan phase (c. 2600–1900 BCE), was characterised by extensive settlement networks, large urban centres, specialised craft production, agricultural and pastoral economies, and long-distance systems of exchange (Wright 2010; Petrie et al. 2017). Animals formed an integral part of these economic and social systems, while their prominence in Harappan visual culture also suggests that their significance extended beyond purely subsistence-related roles.

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The long-standing archaeological interest in this relationship is evident in early discussions of animals in South Asian archaeology. Auboyer (1972), drew attention to the striking frequency of animal representations on Indus seals while simultaneously cautioning that the undeciphered script and the absence of explanatory textual sources make their religious or symbolic significance difficult to establish with certainty. This interpretive restraint remains important. Animals were clearly embedded within Harappan material and economic life, but their appearance in particular archaeological contexts cannot automatically be equated with ritual or symbolic behaviour. Instead their significance must be reconstructed through the association, composition and treatment of the archaeological remains themselves.

Mortuary contexts offer an especially important setting in which to examine these relationships. Harappan communities did not follow a single uniform practice for the treatment of the dead. Instead, considerable variation is evident both geographically and chronologically. At Harappa, the extramural Cemetery R37 contained extended primary inhumations, frequently accompanied by ceramic vessels and other grave goods, while the later Cemetery H documents significant changes in funerary practice during the closing centuries of the Bronze Age. At Mohenjo-daro, different forms of mortuary treatment have been reported, including complete inhumation, fractional burial and the deposition of cremated remains in urns. Excavations at Kalibangan, Farmana, Rakhigarhi, Lothal, Dholavira and other settlements have further demonstrated the diversity of Harappan funerary behaviour, including primary extended inhumations, secondary or fractional burials and graves interpreted as symbolic or cenotaphic (Shinde et al. 2018; Kanungo 2023). Such variability indicates that the treatment of the dead was shaped by local traditions and social practices rather than by a single, uniformly expressed Harappan mortuary system. Within this diverse mortuary record, animal remains constitute a comparatively neglected category of evidence. Zooarchaeological research has played a major role in reconstructing Harappan subsistence and economy, demonstrating the importance of cattle, buffalo, sheep, goats, pigs and a range of wild taxa in different regional and ecological settings (Meadow 1991; Meadow and Patel 2003; Miller 2004; Chase 2014; Suryanarayan 2023). Faunal assemblages have contributed to discussions of herd management, meat consumption, dairying, traction, hunting, craft production and changing relationships between pastoral and agricultural economies. Yet the overwhelming majority of these studies derive from habitation deposits, streets, activity areas and refuse middens, where animal bone frequently occurs in sufficiently large quantities to permit detailed zooarchaeological analysis.

Animal remains recovered from graves have received much less systematic attention. Although bones and other faunal materials have been reported in association with burials at several Harappan sites, they are often recorded only briefly as components of broader grave assemblages. Detailed information concerning species identification, skeletal-element representation, age, surface modification, burning, butchery, articulation and precise spatial relationship to the deceased is frequently unavailable or inconsistently reported. As a result, the burial-specific zooarchaeological dataset remains considerably less developed than the habitation record.

This imbalance has important interpretive consequences. The occurrence of an animal bone within a grave does not necessarily demonstrate deliberate sacrifice, nor does it automatically establish that the animal was intended as an offering to the deceased. Several processes may produce faunal material in mortuary contexts. Complete or articulated animals may represent deliberate burial deposits, while selected portions of carcasses may have been placed as food provisions. Fragmented and processed remains might instead relate to meals consumed during funerary ceremonies, whereas isolated bones could derive from redeposited settlement material, later disturbance or the incorporation of surrounding deposits during grave construction. Distinguishing among these possibilities requires attention not only to taxonomic identification but also to skeletal representation, articulation, modification, preservation and spatial context. More broadly, archaeological interpretations of ritual should remain proportional to the evidence: as early discussions of animals in archaeology recognised, plausible symbolic explanations can easily become overstated when contextual evidence is limited. The interpretation of mortuary fauna also requires comparison with the broader patterns of animal exploitation documented within Harappan settlements. An animal or skeletal element that appears unusual within the habitation record but occurs selectively in graves may indicate deliberate selection. Conversely, correspondence between burial and domestic assemblages may suggest that funerary practices drew upon animals and foods familiar from everyday consumption. Taxonomic abundance alone is therefore insufficient. Questions of anatomical selection, processing, depositional treatment and spatial association must be considered alongside the economic and ecological availability of particular species. Such a contextual approach allows mortuary animal remains to be evaluated as part of wider human–animal relationships rather than treating them automatically as a distinct category of ritual objects.

Despite the potential of this evidence, no comprehensive zooarchaeological synthesis has yet

brought together the scattered reports of animal remains from Mature Harappan mortuary contexts and assessed them against the more extensively documented habitation assemblages. This is significant because regional comparison may reveal whether the incorporation of animals into funerary activity formed a recurring element of Harappan mortuary practice or whether apparently similar deposits represent different local traditions and depositional processes. It may also help identify which interpretations are securely supported by zooarchaeological evidence and which remain largely inferential. The present study therefore provides a critical review and synthesis of animal remains associated with Mature Harappan mortuary contexts (c. 2600–1900 BCE). Rather than beginning from the assumption that such remains represent sacrifices or funerary offerings, it asks what the available archaeological evidence permits us to infer about their deposition and possible roles in practices surrounding death. The review is organised in three stages. First, the available evidence is examined regionally, focusing on the Indus core region, particularly Harappa and Mohenjo-daro; Gujarat and Kutch; and the Ghaggar–Hakra region, with particular attention to Farmana, Rakhigarhi and Mitathal. Relevant evidence from other Harappan contexts is incorporated where it contributes to interpretation. Second, burial-associated faunal remains are evaluated through four related analytical dimensions: taxonomic composition, skeletal-element representation, taphonomic modification, and spatial and contextual association with human remains and other grave materials. These patterns are compared, where possible, with contemporary habitation assemblages. Finally, the review considers several potentially overlapping explanations for the incorporation of animals into mortuary contexts, including food provisioning for the deceased, funerary consumption and feasting, deliberate ritual deposition, and possible expressions of social identity or differentiation. Through this approach, the paper seeks both to establish what can presently be said about animals in Mature Harappan mortuary practice and to identify the methodological and analytical priorities required to advance its zooarchaeological investigation.

2. Methods

2.1 Review design

This study adopts a qualitative narrative synthesis of the published evidence for animal remains in Mature Harappan mortuary contexts. It is not a report of new excavation or zooarchaeological analysis: no previously unstudied faunal assemblage was examined, and no new osteological identification or quantitative analysis was undertaken. The purpose of the review is instead to bring together two bodies of scholarship that have largely developed independently: research on Harappan mortuary

archaeology and zooarchaeological studies of animal exploitation.

The chronological focus is the Mature Harappan phase (c. 2600–1900 BCE), although evidence from immediately preceding or succeeding phases is considered where necessary to clarify the chronology, depositional history, or interpretation of mortuary contexts. These divisions are used as analytical units rather than as assumptions of cultural uniformity within each region. Because the available evidence varies substantially in excavation history, recovery methods, taxonomic resolution and quality of publication, the study does not attempt a formal meta-analysis. Instead, it evaluates the comparability and archaeological context of the available datasets before using them for regional or inter-site interpretation.

2.2 Identification and selection of sources

Relevant literature was identified through targeted searches of archaeological and zooarchaeological publications, supplemented by citation tracing from major reviews and site reports. The corpus includes peer-reviewed journal articles, monographs and edited-volume chapters, doctoral research, cemetery and excavation reports, and specialist faunal studies. Particular use was made of recent syntheses, including Suryanarayan's (2023) review of human–animal relationships within the Indus Civilisation and Joglekar, Sharada and Abhayan's (2013) review of faunal diversity in Haryana. These works were used both for their synthetic discussions and as points of entry into earlier site-specific and specialist literature. Wherever the underlying primary excavation or faunal report could be accessed, the original source was consulted rather than relying solely on a later secondary citation.

Sources were retained where they fulfilled at least one of two criteria: (1) they provided archaeological information concerning Mature Harappan burials, cemeteries or other securely identified mortuary contexts; or (2) they presented zooarchaeological information relevant to the interpretation of animal use at the same sites or within their regional archaeological setting. The latter category was necessary because detailed zooarchaeological studies of Harappan cemeteries remain uncommon, whereas faunal assemblages from habitation areas, streets, middens and activity deposits are considerably better documented. Studies were therefore not excluded simply because the faunal material derived from non-mortuary contexts. Instead, the context of every dataset was recorded and maintained throughout the analysis so that evidence from settlement deposits was not treated as if it derived directly from graves.

2.3 Classification of the evidence

The reviewed literature was initially divided into two broad evidential categories. This distinction is methodologically important because the two datasets are not equivalent. A zooarchaeological

assemblage from a settlement may establish which animals were routinely consumed, managed or processed by a community, but it cannot by itself demonstrate their use in funerary practice. Conversely, a reference to "animal bone" in a burial report may establish spatial association with a grave but provide insufficient zooarchaeological information to determine the species represented, the part of the animal deposited, or whether the material had been processed before deposition. The two datasets are therefore used comparatively rather than conflated. For burial-associated faunal material, particular attention was paid to the certainty of archaeological association. Remains described as lying within the grave fill or in direct spatial relationship with the human body or associated grave goods were distinguished from material recovered from disturbed deposits, cemetery surfaces or contexts for which the relationship with the burial was unclear. Where the published documentation does not permit the association to be established securely, this uncertainty is retained in the present synthesis. Importantly, the presence of animal remains within a grave was not treated automatically as evidence of sacrifice, ritual offering or food provision. Such interpretations were evaluated against the contextual information available for each deposit. Relevant observations include the degree of articulation or anatomical completeness, taxonomic identification, skeletal-element representation, evidence of butchery or burning, fragmentation, position within the grave, relationship to pottery or other grave goods, and evidence for disturbance or redeposition. Where these observations are absent from the original report, interpretations are correspondingly restricted.

2.4 Regional and analytical organisation

Following source classification, evidence was organised geographically into three analytical regions. The first encompasses the Indus core region, represented principally by Harappa and Mohenjo-daro in Punjab and Sindh. The second comprises Gujarat and Kutch, including Sorath Harappan settlements and associated mortuary evidence. The third encompasses the Ghaggar–Hakra region of Haryana, including Farmana, Rakhigarhi and Mitathal. This regional structure facilitates comparison while recognising differences in archaeological traditions, environmental settings, excavation histories and the intensity of zooarchaeological research.

Within each region, faunal evidence was assessed through four principal analytical dimensions commonly employed in zooarchaeological research (Reitz and Wing 1999; O'Connor 2000):

1. Taxonomic representation, including the identification and relative occurrence of domestic and wild taxa;

2. Skeletal-element or body-part representation, where sufficient anatomical information is available;
3. Taphonomic evidence, including fragmentation, burning, cut marks, surface modification and other indicators of processing or post-depositional history; and
4. Spatial and contextual association, particularly the position of animal remains in relation to the human body, grave architecture, ceramic vessels and other mortuary materials.

Together, these categories provide a means of distinguishing simple co-occurrence from more persuasive evidence of deliberate mortuary deposition.

2.5 Treatment of quantitative data

All quantitative information is reproduced from the original publications. Specimen counts, percentages, taxonomic proportions, NISP, MNI and other measures are reported according to the terminology and units employed by the original analysts. No unpublished specimen-level datasets were reconstructed, and no new percentages, ratios or abundance estimates were generated from incomplete published information.

Quantitative results from different sites were not pooled where differences in recovery procedures, sample size, taxonomic identification, chronological resolution or units of quantification prevented meaningful comparison. A percentage derived from an NISP-based assemblage, for example, is not treated as directly interchangeable with a proportion based on MNI or an excavation report providing only general counts. Where published data are insufficient to support quantitative comparison, the evidence is discussed qualitatively. Likewise, the absence of reported animal remains is not automatically interpreted as evidence that animals played no role in mortuary practice. Earlier excavations frequently employed different recovery and recording procedures, and specialist faunal analysis was not consistently undertaken. The review therefore distinguishes, wherever possible, between the reported absence of faunal material and the absence of published zooarchaeological information.

2.6 Approach to interpretation

The final stage of the synthesis compares mortuary assemblages with the wider zooarchaeological record of the corresponding settlements and regions. This comparison is used to assess whether animals represented in graves appear to reflect ordinary patterns of animal exploitation or whether taxa, anatomical portions or depositional treatments were selected disproportionately for mortuary contexts. Interpretations are organised around several non-exclusive possibilities: food placed with the deceased, remains associated with funerary

consumption or feasting, deliberate ritual deposition, and the possible use of animals or animal products in expressing social identity or differentiation. These categories are treated as interpretive hypotheses rather than predetermined functions. Where the available archaeological evidence cannot discriminate between alternative explanations, the ambiguity is retained.

This approach allows the review to identify recurring patterns without imposing a uniform interpretation on highly variable evidence. It also makes visible a central methodological problem in Harappan mortuary zooarchaeology: in many cases, the principal limitation is not the complete absence of animal remains, but the absence of sufficiently detailed contextual and zooarchaeological documentation to determine how those remains entered the mortuary record.

3. Results

The results are presented at two levels. Section 3.1 examines the regional distribution and archaeological context of reported faunal remains associated with Harappan mortuary activity. Attention is given to whether animal remains derive directly from graves, from deposits within cemetery areas, or from habitation assemblages used here only as comparative zooarchaeological evidence. Section 3.2 subsequently considers the evidence thematically through taxonomic composition, skeletal-element representation, taphonomy, and the spatial relationship between faunal material and human burials. A pattern emerges from the reviewed literature: animal remains are reported from, or in association with, mortuary contexts in several parts of the Harappan world, but the quality and resolution of the evidence vary considerably. Dedicated zooarchaeological analyses of burial-specific assemblages are rare. In most regions, detailed knowledge of animal exploitation derives instead from settlement deposits, while cemetery reports provide comparatively limited taxonomic and taphonomic information. The regional evidence therefore requires careful separation of direct mortuary data from the broader zooarchaeological background against which it is interpreted.

3.1 Regional evidence

3.1.1 The Indus core region: Harappa and Mohenjo-daro

Harappa and Mohenjo-daro provide some of the earliest documented evidence for Harappan mortuary practices, although the quality of faunal reporting differs substantially between burial and habitation contexts.

At Harappa, Cemetery R37 represents one of the principal Mature Harappan cemeteries. Burials were generally placed in simple pits, commonly with the body extended along a north–south axis and the head positioned towards the north. Grave assemblages frequently included ceramic vessels and, in some cases, substantial numbers of associated objects

(Wright 2010). Although the cemetery has been central to interpretations of Mature Harappan mortuary practice, animal remains have not received the same degree of systematic zooarchaeological treatment as other categories of grave material. The later Cemetery H, which partly overlies Cemetery R37 and belongs to the post-urban phase, documents change in funerary treatment, including fractional burial and urn deposition. Faunal material has been reported among the contents of some Cemetery H contexts together with fragmentary human remains and other materials. However, published information concerning the taxonomic composition, quantity, skeletal representation, and taphonomic condition of this material remains limited. Consequently, its precise relationship to funerary activity cannot presently be reconstructed in zooarchaeological detail.

The situation at Mohenjo-daro is somewhat different. Early excavators recognised several forms of mortuary treatment, including complete inhumation, fractional burial, and deposits described as post-cremation urn burials. Some urns reportedly contained ash, charcoal, ornaments, and animal bone but little or no identifiable human skeletal material. Such contexts have contributed to interpretations of some deposits as symbolic or commemorative rather than conventional primary interments. Nevertheless, the occurrence of animal bone in these deposits does not by itself establish its function, and the distinction between deliberately deposited fauna and material incorporated through other depositional processes remains difficult to assess from the early excavation records. Sewell and Guha's (1931) contribution to Marshall's publication of Mohenjo-daro represented an early attempt to identify archaeological faunal remains from the site. Some of these identifications, including specimens attributed at the time to domestic fowl, have subsequently been questioned. Later reviews and comparative research have emphasised difficulties surrounding secure identification of early domestic chicken in Indus contexts, illustrating a broader methodological problem: taxonomic identifications made during early excavations require reassessment where original specimens and modern comparative collections are available (Suryanarayan 2023; Peters et al. 2022). By contrast, the zooarchaeological evidence from Harappa's settlement deposits is extensive. Meadow's (1991) analysis of faunal material from excavations conducted between 1986 and 1990 demonstrated the predominance of cattle over water buffalo and identified sheep as more frequent than goats. Miller's (2003, 2004) analyses further investigated cattle management and secondary-product exploitation, suggesting that substantial proportions of cattle survived into adulthood, consistent with their use for milk, traction, and other products in addition to meat.

These studies provide an important baseline for understanding animal management within the urban economy. They cannot, however, be transferred directly to Cemetery R37, Cemetery H, or mortuary deposits at Mohenjo-daro. At present, the core-region evidence therefore reveals a marked imbalance: animal exploitation is comparatively well characterised in settlement contexts, whereas burial-associated fauna remains poorly quantified and inconsistently described.

3.1.2 Gujarat and Kutch

Gujarat has generated some of the most detailed zooarchaeological research within the Harappan cultural sphere, particularly at the Sorath Harappan settlements of Bagasra, Shikarpur, Kanmer, and Kotada Bhadli. This work has substantially expanded understanding of animal husbandry, mobility, consumption, and the organisation of food production. Its relevance to mortuary practice is nevertheless primarily comparative, since most analysed assemblages derive from settlement rather than funerary contexts. At Bagasra (Gola Dhoro), Chase (2010) demonstrated spatial differences in faunal processing between areas within and outside the walled settlement. Variation in butchery and cut-mark frequencies was interpreted as evidence for differences in meat consumption and access, illustrating the potential of zooarchaeological evidence to address questions of social organisation as well as subsistence. At Shikarpur, zooarchaeological analysis indicates differentiated management strategies among domestic taxa. Cattle and buffalo were generally maintained to later ages, consistent with prolonged exploitation for secondary products, whereas sheep and goats were more frequently slaughtered at younger ages and appear to have contributed more directly to meat production (Chase 2014). Subsequent isotopic studies have provided further evidence concerning livestock mobility, feeding practices, and the movement of animals through regional landscapes (Chase et al. 2014a, 2018, 2020).

Research at Kanmer has similarly demonstrated variation in the treatment of domestic and wild animals. Goyal (2017, 2021) identified differences in cooking and processing practices, including a stronger association between roasting and some wild taxa, while cattle exploitation indicates the importance of secondary products. At Kotada Bhadli, archaeozoological, isotopic, and organic-residue studies have further expanded understanding of livestock management and dairy processing. Cattle and buffalo exhibit variable dietary signatures, while pottery residue analysis provides evidence for the processing of animal-derived products, including dairy foods (Goyal et al. 2018; Chakraborty et al. 2018, 2020).

Taken together, these studies provide a comparatively detailed reconstruction of everyday human–animal relationships in Harappan Gujarat.

They demonstrate that cattle, buffalo, caprines, and wild fauna could be incorporated into different systems of production, consumption, mobility, and food preparation. However, none of these settlement assemblages can independently establish how animals were selected or treated within mortuary practice.

More direct evidence may be emerging from Juna Khatiya in Kutch. Excavations have revealed an extensive cemetery containing several hundred graves attributed broadly to the Early and Mature Harappan periods. Reported grave assemblages include ceramic vessels, ornaments, human skeletal remains, shell, and animal bone, with cattle and sheep/goat among the taxa noted in preliminary accounts. This material is potentially important because it provides an association between faunal remains and a specifically mortuary landscape. The evidence nevertheless remains preliminary. Detailed species-by-context inventories, anatomical representation, taphonomic observations, and systematic comparisons between individual graves have not yet been published in a form that permits comprehensive zooarchaeological evaluation. It is therefore premature to classify all reported animal bone from the cemetery as food offerings or deliberate grave deposits. At present, several possibilities remain open, including deposition within individual graves, residues of funerary activities undertaken within the cemetery, and incorporation of material through secondary depositional processes.

The Gujarati evidence consequently presents a striking contrast. The region possesses exceptionally detailed zooarchaeological information concerning settlement economies, while burial-associated faunal evidence remains substantially less resolved. This contrast provides an important comparative opportunity but also establishes a clear limitation on direct interpretation of mortuary animal use.

3.1.3 Haryana: Farmana, Rakhigarhi, and Mitathal

The Ghaggar-Hakra region of Haryana has become an important source of both mortuary and zooarchaeological evidence, particularly through investigations at Farmana and Rakhigarhi. As in Gujarat and the Indus core region, however, the two datasets are not equally developed: detailed faunal studies generally derive from habitation contexts, whereas cemetery publications provide much less systematic zooarchaeological information.

Farmana, excavated extensively during 2007–2008, produced a substantial Mature Harappan cemetery that included primary burials, secondary or fractional interments, and double burials. The site has also generated a comparatively rich faunal record. Zooarchaeological analyses identify cattle and buffalo as major components of the assemblage, with sheep/goat, pig, wild mammals, fish, and other taxa also represented (Joglekar et al. 2013, 2018;

Channarayapatna 2014, 2018). Both meat-bearing and less meat-rich anatomical elements are present among the caprine remains, while some contexts indicate substantial exploitation of freshwater fish and a comparatively diverse wild-faunal component. The principal limitation for the present study is contextual. The published quantitative faunal assemblages derive predominantly from occupation deposits rather than securely identified grave contexts. They provide valuable information concerning animals available to and exploited by the Farmana community but do not establish which of those animals, if any, were selectively incorporated into funerary practice.

Rakhigarhi provides a more explicit association between animal remains and a cemetery landscape. Excavations at cemetery mound RGR-7 between 2013 and 2016 documented considerable variation in mortuary treatment, including typical and atypical primary burials, secondary or fractional burials, symbolic graves lacking a human body, and an apparently unused gravel pit (Shinde et al. 2018). This variability is important because it demonstrates that different forms of treatment of the dead co-existed within the same mortuary area. Of relevance to the present review is the reported recovery of substantial quantities of potsherds and animal bone from areas surrounding burial pits. The excavators interpreted this material as evidence for activities associated with funerary ritual (Shinde et al. 2018). Its location outside or around the graves is significant. Rather than treating these remains automatically as grave offerings, their distribution raises the possibility of activities conducted within the cemetery itself, including food preparation, consumption, deposition, or repeated commemorative practices.

The published evidence does not yet permit these alternatives to be distinguished conclusively. Without detailed taxonomic identification, skeletal-element representation, taphonomic analysis, and fine-grained spatial study of individual

concentrations, the relationship between the animal remains and funerary events remains uncertain. Nevertheless, Rakhigarhi is important because it shifts attention from animals placed inside graves to animal-related activity occurring within the wider mortuary landscape.

Some interpretations of the Rakhigarhi ceramic assemblages have drawn analogies with later textual traditions in which food, milk products, or meat could be offered to the deceased. Such parallels may be heuristically useful, but the substantial chronological separation between Mature Harappan contexts and later textual sources requires caution. In the absence of direct faunal, residue, or contextual evidence demonstrating the original contents of individual vessels, such comparisons are best treated as interpretive possibilities rather than evidence for continuity of practice.

Mitathal provides additional burial and settlement evidence within Haryana, but its zooarchaeological record remains considerably less developed than those of Farmana and Rakhigarhi. The limited availability of detailed faunal information currently prevents meaningful assessment of the relationship between animals and mortuary activity at the site. Taken together, the Haryana evidence is particularly instructive. Farmana provides detailed information on local animal exploitation but comparatively little burial-specific faunal analysis, whereas Rakhigarhi provides clearer evidence for animal bone within a cemetery setting but insufficient zooarchaeological resolution to determine precisely how the material was deposited or

used. This complementarity illustrates the broader problem identified throughout the review: mortuary archaeology and zooarchaeology frequently document different parts of the same behavioural system without yet providing the integrated datasets required to connect them securely.

Table 1. Overview of Harappan mortuary contexts and the reported association of faunal remains

Region	Site/context	Mortuary evidence	Reported faunal association	Evidential status
Indus core	Haryana, Cemetery R37	Mature Harappan extended primary inhumations;	No systematically quantified burial-faunal	Limited : mortuary context well documented

		pottery and other grave goods	assembled, reported	limited, zooarchaeological information poor
Indus core	Haryana, Cemetery H	Fractional and urn burial; post-urban	Faunal material reported in	Limited : association reported

			some context s, but species and quantities insufficiently published	but poorly characterised
Indus core	Mohe njodaro	Complete inhumation, fractional burial, and urn deposits	Animal bone reported with ash, charcoal and ornaments in some urn contexts	Moderate but historically documented: contextual association exists, but early identifications require reassessment
Gujarat	Bagsara, Shikarpur, Kanmer, Kotada Bhadli	Mortuary assemblages not the focus of the major published faunal studies	Extensive settlement zooarchaeology; no comparable burial-specific	Comparative only: useful baseline for animal exploitation

			c faunal dataset	
Gujarat/Kutch	Juna Khatiya	Extensive Early–Mature Harappan cemetery	Cattle, sheep/goat, shell and other animal material reported	Potentially important but preliminary: detailed species-by-grave and taphonomic publication still required
Haryana	Farnaana	Primary, secondary/fractional and double burials	Detailed faunal assemblages published principally from habitation contexts	Comparative only: strong settlement baseline, weak grave-specific faunal evidence
Haryana	Rakhigarhi, RGR-7	Primary typical/atypical, secondary, symbolic and	Substantial quantities of animal bone and	Strong contextual association with cemetery

		unused graves	potsher ds reporte d around burial pits	y activity , but functio n unresol ved
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Harya na	Mitat hal	Burial and settleme nt evidence	Limite d dedicat ed faunal analysi s	Insuffic ient for detailed assessm ent
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The regional comparison demonstrates that the principal problem is not a complete absence of animals from Harappan mortuary contexts. Rather, the evidence is characterised by an uneven relationship between contextual certainty and zooarchaeological resolution. In several cases, animal remains are securely or plausibly associated with cemetery activity but are insufficiently identified or quantified; elsewhere, detailed zooarchaeological assemblages are available but derive almost entirely from habitation contexts. This asymmetry forms the principal evidential constraint on reconstructing the role of animals in Mature Harappan mortuary practice.

3.2 Thematic Zooarchaeological Evidence

The regional review demonstrates a recurrent imbalance between the resolution of zooarchaeological data from settlement contexts and that available from cemeteries. To assess what the existing evidence can nevertheless contribute to the interpretation of mortuary fauna, this section considers four analytical dimensions: taxonomic representation, skeletal-element representation, taphonomy, and spatial association. Settlement assemblages are used as comparative baselines rather than as direct evidence of mortuary practice.

3.2.1 Taxonomic Representation

Published zooarchaeological syntheses indicate that the Harappan animal economy was overwhelmingly based on domestic taxa. Across many Indus assemblages, domestic species constitute approximately 80% of identified faunal remains, although their relative frequencies vary according to region, environmental setting, chronology, and recovery history (Thomas and Joglekar 1994; Thomas 2002; Miller 2004; Joglekar et al. 2013; Chase 2014). Large bovids, particularly zebu cattle (*Bos indicus*) and water buffalo (*Bubalus bubalis*), generally form the largest component and may together account for approximately 50–60% of identified specimens in well-documented assemblages. Their predominance reflects the central position of large livestock within Harappan subsistence and agricultural economies, where animals were exploited not only for meat but also for milk, traction, and other secondary products. Regional variation is nevertheless substantial. At Harappa, cattle considerably outnumber water buffalo, while sheep occur more frequently than

goats (Meadow 1991). Caprines generally form a smaller component of assemblages than bovids, accounting for around 10% in some assemblages from the alluvial plains, although their proportions and the balance between sheep and goat vary geographically. Sheep appear relatively prominent in the better-watered environments of Punjab, whereas goats assume greater importance in some of the drier areas of Gujarat (Meadow 1991; Wright 2010). Pig (*Sus* spp.) is consistently represented in much smaller quantities, often in the range of approximately 2–3%, although questions concerning the relative contributions of domestic and wild populations remain unresolved in some assemblages (Thomas 2002; Chase 2014).

Wild animals form a smaller but persistent component of the Harappan faunal record. Deer, antelope, gazelle, hare, birds, fish, molluscs, and other taxa occur with frequencies that vary considerably according to local ecology and site location (Belcher 1991, 2003; Suryanarayan 2023). Their presence demonstrates that hunting, fishing, and the exploitation of aquatic resources continued alongside livestock husbandry. At some sites or within particular deposits, these resources could be locally significant even where they formed only a minor proportion of the broader regional economy. Farmana is particularly noteworthy in this respect, with published settlement assemblages documenting considerable diversity among wild mammals and aquatic fauna (Joglekar et al. 2013; Channarayapatna 2014, 2018).

For the purposes of mortuary interpretation, however, the critical observation is that no burial-specific taxonomic dataset of comparable resolution is currently available. Detailed taxonomic profiles from Harappa, Farmana, Bagasra, Shikarpur, Kanmer, and related sites derive predominantly from habitation or refuse deposits. They establish the range and relative economic importance of animals available to Harappan communities, but they cannot demonstrate which taxa were deliberately selected for funerary deposition.

The evidence from mortuary contexts is considerably less precise. At Juna Khatiya, preliminary reports indicate the occurrence of cattle and sheep/goat remains within the cemetery assemblage, but species-by-grave counts and quantitative taxonomic distributions have not yet

been published. At Mohenjo-daro and Harappa, early reports record faunal material in some mortuary deposits, but taxonomic identification and quantification remain insufficient for comparison with the better-documented habitation assemblages. Rakhigarhi similarly provides clear evidence for animal bone within the cemetery landscape, but published information does not yet permit construction of a burial-specific taxonomic profile. This distinction is important because similarity between settlement and cemetery taxa cannot be assumed merely from their presence. If cattle and caprines were common within everyday economic life, their occurrence in a mortuary setting may simply reflect their general availability; conversely, repeated or disproportionate selection of a particular taxon for graves could indicate a more restricted funerary choice. Demonstrating such selection requires comparison between securely identified burial assemblages and appropriate settlement baselines, which is currently possible only to a limited degree.

A further taxonomic problem concerns early reports of domestic fowl. Bones originally identified as domestic chicken (*Gallus gallus domesticus*) have sometimes been incorporated into reconstructions of Harappan animal use, including interpretations of food consumption or ritual activity. More recent

osteological and biomolecular research, however, has questioned secure evidence for domestic chicken in Mature Harappan contexts and suggests that its widespread exploitation in South Asia developed later (Peters et al. 2022; Suryanarayan 2023). Earlier identifications from Mohenjo-daro and related sites should therefore not be accepted uncritically. Wild birds, including peafowl and other avian taxa, remain part of the Harappan record, but the presence of bird bone should not automatically be equated with domestic poultry.

The taxonomic evidence thus establishes a useful economic baseline but also exposes a central limitation of the mortuary dataset. We know considerably more about which animals Harappan communities kept, consumed, hunted, and processed than about which animals were deliberately incorporated into practices surrounding death. At present, the latter question cannot be resolved through taxonomic frequency alone.

Table 2. Comparative taxonomic patterns in selected Harappan zooarchaeological assemblages. Figures and observations are reproduced from the cited publications and are not treated as directly comparable where different analytical units or recovery procedures were employed.

Taxonomic group	Gene pool	Harappa	Gujarat	Farman	Relevance to mortuary interpretation
Cattle/buffalo (<i>Bos/Bubalus</i>)	Commonly dominant; together approximately 50–60% in	Cattle dominant; :buffalo reported at approximately	Large bovids dominant at several sites; evidence for	Major component of the published faunal assemblage	Establishes high everyday availability; burial selection cannot be
Sheep/goat	Secondary	Sheep	Imp	Ortan	Potential

at (Ovis /Cap ra)	to large bovid s; aroun d 10% in some alluvi al- plain assem blage s	outn umbe r goats (Mea dow 1991)	t meat anim als at seve ral sites; gene rally slau ghter ed youn ger than large bovi ds (Cha se 2014)	ne speci mens repor ted; secur e speci es- level ident ificat ions inclu de goat and shee p (Jogl ekar et al. 2018)	food- provisi oning taxon, but burial- specifi c anato mical and quantit ative data are lackin g
Pig (Sus spp.)	Usual ly a minor comp onent, often appro ximat ely 2– 3%; dome stic status of some remai	Prese nt in settle ment asse mbla ges	Pres ent in relati vely small quan tities	Eight speci mens repor ted in the analy sed asse mbla ge (Jogl ekar et al. 2018)	Insuffi cient burial eviden ce to assess deliber ate selecti on

	ns debat ed				
Wild mam mals	Gener ally minor but recurr ent; comp ositio n envir onme ntally variab le	Wild taxa prese nt	Deer and other wild speci es expl oited ; proc essin g diffe renc es docu ment ed at som e sites	High wild- taxon diver sity repor ted	Could provid e eviden ce of selecti ve mortua ry use if dispro portio nately repres ented in graves , but this remain s undem onstrat ed
Fish and aqua tic reso urces	Impor tance varies strong ly with local ecolo gy	Fish repre sente d in the wide r settle ment recor d (Belc her	Aqu atic reso urce s vary betw een inlan d and coast al	Fresh water fish parti cular ly prom inent in some depo sits	No compa rable burial- specifi c dataset presen tly availa ble

		1991)	setti ngs		
Domestic fowl (<i>Gallus</i>)	Secure Mature Harappan domestic status	Early identifications have been questioned	Not securely reported	Not reported	Earlier mortuary identification requires reassessment

	not demonstrated		assemblages		rather than use as evidence for funerary poultry deposition
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3.2.2 Skeletal-Element Representation

Taxonomic identification establishes which animals are represented, but the anatomical portions deposited can provide a different level of information concerning how animals were processed and the activities that produced an assemblage. In zooarchaeological analysis, skeletal-element representation is particularly relevant to distinguishing between complete or near-complete animals, selected meat-bearing portions, processing waste, and redeposited refuse. In a mortuary setting, this distinction is potentially important because a deliberately placed joint of meat, the deposition of an articulated animal, and isolated fragments incorporated into grave fill represent substantially different forms of human behaviour.

For the Mature Harappan mortuary record, however, skeletal-element representation remains one of the least adequately documented dimensions of the evidence. Published burial reports frequently note the presence of "animal bone" without providing inventories by anatomical element, side, age, articulation, or degree of completeness. Consequently, it is rarely possible to determine whether a reported faunal deposit represents an entire animal, a selected carcass portion, a prepared food portion, or a small quantity of disarticulated material.

The better evidence again derives from settlement contexts. At Farmana, sheep and goat assemblages contain both meat-bearing and less meat-rich skeletal elements. Studies of anatomical distribution across residential contexts have further suggested that different household units did not necessarily receive identical portions of animal carcasses in every occupational phase (Channarayapatna 2014, 2018). Such variation has been interpreted in

relation to the distribution, sharing, or differential access to animal products within the settlement.

This evidence is relevant to mortuary interpretation because it demonstrates that animal carcasses were not necessarily distributed uniformly even within everyday consumption contexts. If skeletal portions were selectively allocated to different households, comparable processes of selection may also have operated during funerary events. Particular joints could, for example, have been placed with the deceased, consumed by mourners, or deposited during activities conducted around the grave. These possibilities, however, remain hypotheses rather than demonstrated Harappan practices.

The distinction between complete animals and selected portions is particularly important. An articulated or anatomically coherent deposit would provide stronger evidence for deliberate placement than an isolated fragment recovered from grave fill. Similarly, repeated selection of high-meat-bearing elements could be consistent with food provisioning, while concentrations of heavily fragmented or processed bone might be more compatible with consumption debris. Cranial, foot, horn-core, or other low-meat elements could potentially reflect different processes again. None of these associations is inherently ritual, and their significance depends upon depositional context and taphonomic condition.

At present, the published Harappan evidence rarely provides this level of resolution. The problem is especially evident at sites such as Rakhigarhi, where substantial quantities of animal bone are reported from areas around burial pits but anatomical distributions have not been published in sufficient detail to establish whether these remains represent selected portions, whole carcasses, consumption debris, or redeposited material. The same limitation

applies to the preliminary mortuary evidence from Juna Khatiya.

Accordingly, skeletal-element representation constitutes one of the clearest analytical gaps in Harappan mortuary zooarchaeology. Future reporting should record element, portion, side, fragmentation, articulation, age, and spatial position for fauna recovered from both graves and associated cemetery surfaces. Only with such information will it become possible to test whether particular anatomical portions were preferentially selected for mortuary deposition and whether these differed systematically from the carcass-distribution patterns documented in contemporary habitation assemblages.

The present evidence therefore permits an important distinction. Harappan settlement zooarchaeology demonstrates that carcass processing and the distribution of animal portions were structured social practices. What remains unresolved is whether mortuary communities drew upon those same systems of distribution or created a distinctive selection of animal parts specifically for funerary use.

3.2.3 Taphonomic Evidence

Taphonomic analysis provides an important means of moving beyond the simple presence or absence of animal remains to examine how carcasses were processed, exposed to heat, deposited, and subsequently altered. Cut marks, burning, fragmentation, weathering, and other forms of bone-surface modification may therefore help distinguish between butchery and food preparation, consumption debris, deliberate deposition, and post-depositional processes. In mortuary contexts, such observations are particularly important because the occurrence of animal bone alone cannot establish whether the material represents a food offering, the remains of funerary consumption, or material incorporated into grave fills through unrelated depositional processes.

Detailed taphonomic information is available from several Harappan settlement assemblages, particularly in Haryana. At Farmana, Girawad, Masudpur I, and Masudpur VII, faunal remains exhibit evidence of butchery and thermal alteration, including cut marks and heavily charred or vitrified bone (Joglekar et al. 2013, 2016, 2017; Channarayapatna 2014, 2018). Some cut marks have been interpreted as consistent with the use of sharp metal implements, indicating systematic carcass processing.

The Farmana assemblage is particularly informative because thermal modification appears to vary according to taxon and anatomical element. Cattle and buffalo remains display charring across a comparatively broad range of skeletal elements, whereas burnt sheep and goat remains are reported more selectively among cranial fragments, ribs, scapulae, vertebrae, and phalanges (Channarayapatna 2014, 2018). This patterned distribution suggests that burning was not necessarily the result of a single, uniform post-depositional process. Instead, at least some thermal alteration may relate to differences in carcass preparation, cooking, or disposal practices among taxa. The precise behavioural processes responsible, however, cannot be established from burning alone.

Comparable evidence for differentiated processing occurs in Gujarat. At Kanmer, Goyal (2017) identified variation in thermal treatment between wild and domestic taxa, with roasting more strongly represented among some wild animals, particularly deer. At Bagasra, Chase (2012) documented spatial variation in butchery evidence, with cut-marked specimens proportionally more frequent within the walled enclosure than in areas outside it. This pattern was interpreted as reflecting differences in the preparation or consumption of animal products between sectors of the settlement. Shikarpur presents a somewhat different pattern: skeletal elements from different portions of carcasses occur across settlement areas, suggesting less pronounced spatial differentiation in carcass distribution than that identified at Bagasra (Chase 2012, 2014).

These patterns demonstrate that Harappan animal processing was neither uniform nor socially or spatially undifferentiated. Taxon, anatomical portion, cooking practice, and location within a settlement could all influence the taphonomic signatures ultimately preserved on animal bone. This observation is important for mortuary zooarchaeology because similar signatures, if documented in securely associated cemetery deposits, could provide evidence for the sequence of practices through which animal remains entered mortuary contexts.

At present, however, the relevant evidence remains largely indirect. The detailed cut-mark, burning, and carcass-processing patterns described above derive principally from habitation, midden, and other settlement deposits rather than from animal remains securely recovered within Harappan graves. They therefore provide comparative expectations rather than direct evidence for funerary consumption or feasting. For example, burnt or cut-marked animal bone recovered from a cemetery could be consistent with food preparation or consumption, but such an interpretation would require demonstration that the

material was securely associated with mortuary activity and could not more plausibly derive from pre-existing settlement debris, accidental burning, or subsequent disturbance.

This distinction is especially relevant at Rakhigarhi, where animal bones and potsherds have been reported from areas surrounding burial pits. If future analysis were to demonstrate patterned burning, butchery marks, restricted anatomical representation, or repeated spatial associations between such remains and individual graves, the evidence could provide a stronger basis for evaluating activities such as funerary food preparation or consumption. In the absence of such taphonomic documentation, however, the reported association cannot yet distinguish between funerary behaviour and other depositional processes.

Preservation introduces an additional limitation. Faunal remains from a number of Indus sites are affected by mineralisation, salt deposition, calcitic encrustation, and other diagenetic processes that may obscure bone surfaces and complicate the identification of fine cut marks, percussion damage, burning, and other modifications (Chase et al. 2014a; Joglekar et al. 2017). Surface preservation therefore needs to be recorded explicitly before the apparent absence of butchery or other modifications is interpreted behaviourally. A specimen on which no cut mark is visible is not necessarily equivalent to a well-preserved specimen on which cut marks are demonstrably absent.

Biomolecular preservation presents a related problem. Poor collagen survival in many Indus

faunal remains may restrict collagen-based stable-isotope analysis and techniques dependent upon preserved bone proteins, including Zooarchaeology by Mass Spectrometry (ZooMS) (Lightfoot et al. 2020; Suryanarayan 2023). This limitation does not apply equally to all biomolecular approaches: tooth enamel, for example, has supported carbon, oxygen, and strontium isotope analyses at several Harappan sites. The analytical potential of mortuary fauna must therefore be assessed according to the preservation of the specific skeletal tissue and biomolecule required by each technique rather than assuming uniformly poor preservation.

Overall, the existing taphonomic record demonstrates considerable variation in the processing and thermal treatment of animals across Harappan settlements, but equivalent burial-specific taphonomic datasets remain largely absent. This constitutes a major limitation for interpreting animal remains from cemeteries. Systematic recording of cut marks, percussion damage, burning intensity, fragmentation, articulation, weathering, carnivore activity, and other surface modifications, combined with precise spatial provenience, would make it possible to distinguish more securely among food provisioning, funerary consumption, deliberate deposition, redeposited settlement refuse, and post-depositional disturbance.

Table 3. Taphonomic patterns reported from selected Harappan faunal assemblages. The evidence derives from settlement or habitation contexts and is used here as a comparative baseline rather than as direct evidence for mortuary practice.

Site/ region	Butchery evidence	Thermal modification	Principal pattern	Mortuary relevance	Source
Farman a / Girawa d, Harayan a	Cut mark s, some interp reted as consi stent with	Exten sive charring and vitri fication n repor ted	Cattle /buff alo show burni ng across a broad range	Provi des a comp arativ e signat ure for asses sing	Joglek ar et al. 2013, 2016, 2017; Chann arayap atna 2014, 2018

sharp metal imple ments	of elem ents; sheep /goat burni ng is more restri cted anato mical ly	whet her cemet ery fauna under went comp arabl e prepa ration or cooki ng
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Masudpur I and VII, Hariana	Butchery evidence reported	Substantial thermal alteration, including charred material	Demonstrates recurrent burning of faunal material within regional settlement assemblages	Useful regional baseline; no direct mortuary association established	Joglekar et al. 2013, 2016, 2017
Kanmer, Gujarat	Butchery and processing evidence present	Roasting documented	Thermal treatment more strongly associated with some wild taxa, particularly deer	Indicates taxon-specific food preparation that could be tested against future mortuary asse	Goyal 2017

				mblages	
Bagasra (Gola Dholi, Gujarat)	Cut-marked bone proportionally more frequent within the walled enclosure	Not central to the reported pattern	Spatial variation interpreted in relation to differential meat preparation or consumption	Demonstrates that carcasses processing can vary socially and spatially within a settlement	Chase 2012
Shikarpur, Gujarat	Butchery represented across settlement areas	—	Skeletal portions distributed relatively widely across site areas	Provides contrast with the stronger spatial differentiation documented at Bagaasra	Chase 2012, 2014

The taphonomic evidence therefore reveals a second important asymmetry in the Harappan record: we can reconstruct how animals were butchered, cooked, and distributed in considerable detail in some settlements, but we cannot yet determine whether the animal remains associated with cemeteries underwent the same or different treatments. Resolving this question is essential before funerary feasting, food offerings, or sacrificial practices can be identified archaeologically with confidence.

3.2.4 Spatial and Contextual Association

The spatial relationship between faunal remains and human burials is critical to the interpretation of animal use in mortuary practice. Animal bone recovered from within a grave, in direct association with a human skeleton or grave goods, carries a different evidential weight from material found in grave fill, on cemetery surfaces, or in deposits surrounding burial pits. The Harappan evidence encompasses several of these forms of association, but the degree of contextual precision varies considerably between sites.

Rakhigarhi provides one of the clearest examples of faunal material associated with a mortuary landscape. Excavations at the RGR-7 cemetery documented substantial quantities of animal bone and potsherds in areas surrounding burial pits (Shinde et al. 2018). Importantly, this material was distinguished from the formal contents of individual graves. Its distribution therefore points to activities taking place within the cemetery environment rather than demonstrating that animal parts were deposited directly with specific individuals. The association is nevertheless significant because it indicates that animal-related material formed part of the broader use of the mortuary space.

This distinction has interpretive consequences. Concentrations of animal bone around graves may be consistent with food preparation, consumption, repeated commemorative activity, or the deliberate deposition of materials during funerary ceremonies, but none of these interpretations can be established from spatial association alone. Without species-level identification, skeletal-element inventories, taphonomic observations, and detailed mapping of individual concentrations, it remains difficult to determine whether the Rakhigarhi material represents the remains of funerary meals, offerings deposited outside graves, redeposited settlement debris, or a combination of different processes.

At Harappa, the relationship between fauna and mortuary practice is less clearly documented for the Mature Harappan Cemetery R37. Published

descriptions of grave assemblages are dominated by ceramic vessels, ornaments, and personal objects, whereas animal remains have not been reported with comparable consistency or quantitative detail. This does not necessarily demonstrate their absence but rather highlights the limited zooarchaeological resolution of the published mortuary record. The later Cemetery H provides somewhat clearer evidence for the occurrence of faunal material within funerary deposits, particularly urn contexts, although species identification, anatomical representation, and quantitative information remain insufficient for detailed reconstruction of depositional practice.

Mohenjo-daro presents a different form of association. Animal bone has been reported from vessels identified by early excavators as post-cremation or funerary urns, sometimes together with ash, charcoal, and personal ornaments but without readily identifiable human skeletal remains. This represents a more direct contextual association than the cemetery-surface deposits documented at Rakhigarhi. Nevertheless, the interpretation of these urns remains problematic. The absence of identifiable human bone does not necessarily demonstrate that animal remains substituted symbolically for the deceased, nor can it establish that the deposits were deliberately commemorative in character. Such interpretations remain possibilities rather than demonstrated functions, particularly given the limitations of early excavation and recording practices.

The emerging evidence from Juna Khatiya in Kutch may provide another important example of fauna associated with burial contexts. Animal bone has been reported among the materials recovered from the extensive cemetery, alongside human remains, ceramic vessels, and ornaments. However, currently available publications do not provide sufficiently detailed grave-by-grave documentation to establish whether individual animal specimens were deliberately placed beside particular individuals, deposited within specific containers, or recovered more generally from grave fills or cemetery deposits. The site is therefore potentially important, but its contribution to mortuary zooarchaeology will depend on more detailed contextual publication.

Taken together, the evidence reveals at least three distinct levels of faunal association with Harappan mortuary contexts. First, animal remains may occur within funerary containers or grave deposits, as reported at Mohenjo-daro and in some Cemetery H contexts. Second, fauna may occur within the immediate cemetery environment but outside the formal grave assemblage, as at Rakhigarhi. Third, animal bone may be reported from a cemetery or

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necropolis without sufficient documentation to establish its precise relationship to individual burials, as currently appears to be the case at Juna Khatiya.

These categories should not be treated as equivalent. Direct placement beside a human body, the deposition of an articulated animal within a grave, a concentration of butchered bone around a burial pit, and isolated fragments recovered from cemetery sediment represent potentially different depositional histories and forms of mortuary behaviour. The interpretive significance of animal remains therefore depends not simply upon their presence within a cemetery, but upon their precise spatial relationship to the deceased, grave architecture, containers, and other associated materials.

A further limitation is that Harappan burial publications generally document ceramic vessels, ornaments, skeletal position, body orientation, and grave architecture in considerably greater detail than faunal remains. As a result, it is often possible to reconstruct the location of pottery or jewellery in relation to the deceased while being unable to determine whether animal bone was positioned near the head, hands, feet, torso, or outside the grave altogether. This difference in recording resolution substantially constrains attempts to evaluate patterned animal deposition. The available evidence therefore supports a cautious but important conclusion. Animal remains occur repeatedly within Harappan mortuary landscapes across geographically separated regions, suggesting that their presence cannot be dismissed as an isolated phenomenon. At the same time, the archaeological record does not yet support the assumption of a single, standardised Harappan practice of animal offering. The nature of the association varies from site to site, ranging from fauna within funerary containers to animal bone distributed around graves or more generally across cemetery areas. Future mortuary zooarchaeological work should therefore prioritise high-resolution spatial recording of every faunal specimen in relation to the human body, grave architecture, ceramic vessels, and other grave goods. Three-dimensional provenience, anatomical identification, articulation, taphonomic condition, and refitting between specimens from inside and outside graves would allow much stronger assessment of whether animal remains represent deliberate grave deposits, funerary consumption, cemetery-surface activity, or secondary incorporation.

In this respect, spatial association provides the crucial link between zooarchaeological identification and behavioural interpretation. Taxonomy establishes which animals were present, skeletal-element analysis identifies which portions

of the animal were represented, and taphonomy provides evidence for their treatment; spatial context determines whether these observations can reasonably be connected to the burial event itself.

4. Discussion

The evidence reviewed above indicates that animals formed a recurrent, although unevenly documented, component of Harappan mortuary landscapes. What remains considerably more difficult to establish is the nature of their involvement. The available evidence does not support a single explanation applicable across sites, nor does it justify treating all animal remains from cemeteries as offerings or sacrifices. Instead, at least four potentially overlapping interpretations require consideration: provisioning of the deceased, funerary consumption and feasting, deliberate ritual deposition, and the expression of social differentiation. These interpretations are best regarded as hypotheses to be evaluated against contextual, anatomical, taphonomic and spatial evidence rather than as predetermined categories of mortuary behaviour.

4.1 Food provisioning and the deceased

One possible interpretation is that animals or animal products were placed with the dead as provisions. This interpretation has been proposed most explicitly for Rakhigarhi, where ceramic vessels accompanying burials have been discussed in relation to later textual traditions describing the placement of food and animal-derived products with the deceased. Such practices could conceivably have included meat, milk, curd, ghee or other prepared foods. Provisioning is a well-established interpretive category in comparative mortuary archaeology, particularly where animal remains occur as selected meat-bearing portions, articulated joints or food containers positioned in close association with the body. In the Harappan case, however, this interpretation remains difficult to demonstrate directly. The analogy with later Vedic texts is separated from Mature Harappan contexts by a substantial chronological interval, and continuity between the two cannot be assumed. More importantly, the currently published Harappan evidence rarely combines identified animal remains, skeletal-element information and precise within-grave provenience in a form that would demonstrate the deliberate placement of food with an individual. Ceramic vessels themselves therefore cannot be assumed to have contained animal products simply because such practices are documented in later traditions. Residue analysis associated faunal material, vessel position and other contextual evidence would be required to evaluate this possibility securely. Provisioning remains plausible,

but at present it is better treated as a testable hypothesis than as an established feature of Mature Harappan funerary practice.

4.2 Funerary consumption and feasting

A second possibility concerns the consumption of food by participants in funerary or commemorative activities. This interpretation is particularly relevant to animal remains recovered around, rather than within, graves. The concentrations of animal bone and potsherds documented in the cemetery area at Rakhigarhi are therefore potentially significant. Their location outside formal grave assemblages may indicate activities undertaken during burial ceremonies, subsequent commemoration, or repeated use of the cemetery landscape. Funerary meals provide one possible explanation for such deposits. Archaeologically, this interpretation would be strengthened by repeated concentrations of butchered and thermally modified bone, serving or cooking vessels, hearth-related material, and patterned spatial relationships with burial pits. The settlement zooarchaeological evidence demonstrates that Harappan communities employed differentiated methods of carcass preparation and cooking. Taxon-specific charring at Farmana and variation in roasting practices at Kanmer show that thermal treatment of animal products could be structured rather than random.

These settlement patterns provide useful comparative signatures, but they do not demonstrate funerary feasting in themselves. As emphasised in Section 3.2.3, the detailed evidence for butchery and burning currently comes predominantly from habitation contexts. Until comparable taphonomic signatures are demonstrated in securely associated cemetery deposits, funerary feasting remains a reasonable interpretation of some contexts, particularly Rakhigarhi, but not a conclusion that can yet be established directly.

The distinction between food placed for the deceased and food consumed by participants in the funeral is especially important. Both practices could produce animal bone within a mortuary landscape, but they should leave different archaeological signatures. Selected meat-bearing portions placed within graves would provide stronger evidence for provisioning, whereas fragmented, butchered and burnt assemblages distributed outside graves may be more consistent with preparation and consumption by mourners. Establishing this distinction requires precisely the spatial and skeletal-element information that is presently lacking for many Harappan cemeteries.

4.3 Deliberate ritual deposition and sacrifice

A third interpretive possibility is that some animals or animal parts were deliberately deposited as components of funerary ritual beyond their role as food. The presence of fauna within mortuary contexts frequently encourages the language of "sacrifice" or "offering", but these terms require caution.

Animal sacrifice implies more than the presence of animal bone in a cemetery. Ideally, such an interpretation should be supported by evidence that an animal was deliberately killed in relation to the mortuary event, such as articulated or near-complete carcasses, patterned selection by age or species, repeated deposition in comparable locations, perimortem modifications, or other contextual indicators. Such evidence has not yet been demonstrated systematically for Mature Harappan cemeteries.

The urn deposits at Mohenjo-daro are relevant in this respect because animal bone occurs in funerary containers alongside ash, charcoal and other materials. These associations suggest deliberate deposition more strongly than isolated bone from general cemetery sediment, but their precise meaning remains uncertain. In particular, the presence of animal remains in urns lacking identifiable human bone does not establish that animals symbolically substituted for the deceased. Commemorative deposition, food-related activity and other funerary practices remain alternative explanations.

It is therefore preferable to use deliberate ritual deposition as a broader interpretive category where contextual evidence supports intentional placement, reserving the more specific term sacrifice for cases in which the killing and deposition of an animal can be archaeologically demonstrated.

4.4 Animals and social differentiation

The fourth possibility is that differential access to animals, meat or particular animal products contributed to the expression of social distinctions in death. Harappan cemeteries exhibit considerable variation in grave assemblages. Individuals differ in the number and range of ceramic vessels and ornaments deposited with them, while some graves also exhibit greater architectural elaboration. Such variation has contributed to wider debates concerning the extent and character of social differentiation within Harappan communities.

Faunal remains could potentially provide an additional line of evidence in this debate. If certain individuals were consistently associated with larger quantities of animal food, particular species,

selected anatomical portions, or animals requiring greater economic investment, this might indicate differential access to resources within mortuary practice. The zooarchaeological evidence from settlement contexts demonstrates that access to animal products could itself be socially structured. At Bagasra, for example, spatial variation in butchery and meat-processing patterns has been interpreted in relation to differences between areas of the settlement. This establishes that animal consumption has the potential to illuminate social organisation within Harappan communities.

At present, however, comparable grave-by-grave faunal data are largely unavailable. Variation in pottery quantity or grave architecture should not automatically be equated with social rank, nor can animal remains be interpreted as status markers simply because they occur in an elaborated burial. Demonstrating a relationship between animals and social differentiation would require systematic comparison of faunal abundance, taxonomic selection, anatomical portions and treatment across graves, ideally in relation to age, sex, grave architecture and other categories of material culture.

The potential is nevertheless considerable. Burial fauna could eventually provide a means of examining whether inequalities in access to animal resources documented in life were reproduced, transformed or deliberately obscured in death.

4.5 Distinguishing mortuary behaviour from depositional processes

Underlying all four interpretations is a more fundamental problem: not every animal bone recovered from a cemetery necessarily originated in a mortuary activity. Cemetery areas may incorporate pre-existing occupation deposits, refuse introduced with grave fill, material displaced during repeated digging, later disturbances and natural or animal-mediated processes.

This alternative needs to remain explicit because the archaeological significance of faunal remains depends first upon demonstrating their association with the burial event. An articulated animal positioned within a grave constitutes a fundamentally different form of evidence from an isolated fragment within disturbed fill. Similarly, a patterned concentration of burnt and butchered bone around several graves differs from occasional fragments dispersed across a cemetery surface.

The interpretive sequence should therefore move from association to behaviour, rather than beginning with ritual terminology. The first question is whether the fauna is securely associated with the mortuary

context; the second concerns which animals and anatomical portions are represented; the third concerns how they were processed; and only after these questions have been addressed should interpretations such as provisioning, feasting, ritual deposition or sacrifice be considered.

4.6 Regional variation and the limits of the current evidence

The review also raises the possibility that relationships between animals and mortuary practice varied across the Harappan world. Such variation would be unsurprising given the ecological and economic diversity of the civilisation. Zooarchaeological studies already demonstrate regional differences in herd management, hunting, fishing, animal mobility, secondary-product exploitation and food preparation. Gujarat, Haryana and the Indus core region cannot therefore be assumed to have shared identical human–animal relationships.

Whether these differences extended into mortuary practice remains unresolved. The prominence of particular taxa within local settlement economies provides an essential baseline for evaluating burial assemblages, but economic abundance does not necessarily translate into ritual significance. A commonly consumed animal could be deliberately excluded from funerary contexts, while a relatively uncommon species could be selected precisely because of its restricted availability or social meaning.

For this reason, the most informative future comparisons will not simply ask whether cattle, caprines or wild animals occur in graves. They will ask whether their representation in mortuary contexts differs systematically from that expected on the basis of contemporary settlement assemblages. Such comparisons offer a means of distinguishing ordinary availability from deliberate selection.

The principal finding of the present synthesis is therefore methodological as much as interpretive. Harappan archaeology possesses a sophisticated zooarchaeological literature capable of reconstructing herd management, butchery, cooking, livestock mobility and animal consumption, and an increasingly detailed mortuary archaeology capable of reconstructing grave architecture, body treatment and funerary material culture. Yet these two bodies of evidence have rarely been integrated at the level of individual burials. Until that gap is addressed, interpretations of animals in Harappan funerary practice will necessarily remain provisional.

5. Conclusion

This review demonstrates that animal remains recur within Harappan mortuary landscapes, but their archaeological associations and analytical resolution vary substantially between sites. Faunal material has been reported from funerary containers at Mohenjodaro and Cemetery H at Harappa, from the developing cemetery record at Juna Khatiya, and, most clearly at the level of the wider cemetery landscape, from concentrations surrounding burial pits at Rakhigarhi. By contrast, detailed taxonomic, skeletal-element and taphonomic analyses remain overwhelmingly concentrated on settlement assemblages. The resulting picture is therefore not one of an absence of evidence, but of an imbalance between mortuary context and zooarchaeological resolution. In some cases, the relationship between fauna and a cemetery is reasonably clear but the bones themselves remain poorly identified or quantified. In others, animal exploitation can be reconstructed in considerable detail, but the assemblages derive from habitation deposits and cannot be used directly to infer funerary practice.

The available evidence permits several interpretations of the role of animals in practices surrounding death. Animal products may have been deposited as provisions for the deceased, consumed during funerary or commemorative meals, incorporated as deliberate ritual deposits, or used in ways that contributed to expressions of social differentiation. These possibilities are not mutually exclusive, but neither can they be distinguished confidently with the existing evidence. In particular, the current record does not justify treating animal bone from Harappan cemeteries automatically as evidence of sacrifice or offering.

Future research should therefore prioritise the integration of mortuary excavation and zooarchaeological analysis from the point of recovery onwards. Faunal material from graves, grave fills and surrounding cemetery surfaces should be recorded and analysed separately, with precise three-dimensional provenience. Taxonomic identification should be combined with systematic recording of skeletal-element representation,

articulation, age, fragmentation, cut marks, burning and other taphonomic modifications. Such data would permit direct comparison between within-grave deposits, cemetery-surface assemblages and contemporary settlement refuse. Biomolecular approaches also have considerable potential where preservation permits. ZooMS may assist taxonomic identification where morphological characteristics are poorly preserved, while isotope analyses can address questions of animal diet, mobility and geographical origin using appropriate skeletal tissues. Organic-residue analysis of vessels associated with burials could provide an independent means of testing whether containers held dairy products, animal fats or other foodstuffs rather than inferring their contents from later textual analogy alone.

Equally important is the full publication of faunal assemblages from cemeteries presently under investigation, particularly those that provide opportunities to connect animal remains to individual graves and burial events. Grave-by-grave comparison would make it possible to test whether taxa or anatomical portions were selectively associated with specific forms of burial, grave architecture or other categories of material culture, and whether such patterns varied between regions.

The broader significance of this research extends beyond identifying what Harappan

communities ate at funerals. Animals stood at the intersection of subsistence, labour, exchange and social life, and their incorporation into mortuary practices potentially offers a distinctive perspective on how relationships formed in life were reformulated in death. A genuinely integrated mortuary zooarchaeology would therefore allow research to move beyond demonstrating the presence of animals in Harappan cemeteries towards explaining the practices through which they became part of the treatment, commemoration and social representation of the dead.

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