Modified Knucklebones as Gaming Artefacts: Insights from Vadnagar

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Abstract: *Knucklebones, or astragali, from mammals and other species, are frequently encountered in archaeological sites across various cultural periods. Archaeological evidence indicates that these bones were used in various social and cultural settings, including religious ceremonies and burial rituals. Knucklebones from several animals were utilized, with sheep (Ovis aries), goats (Capra hircus), pigs (Sus domesticus), and various wild mammals of similar sizes being the most commonly employed. The manageable sizes of the astragali bones of these animals facilitated handling for a range of purposes. Previous excavations at Vadnagar, a multicultural site located in Gujarat, have uncovered several knucklebones from the Kshatrapa period (1st – 4th century CE), including both worked and unworked specimens. This paper examines these bones using standard archaeozoological methods to enhance our understanding of their usage. The study provides insights into the selection of animal species, types of modifications, processes involved in their preparation, and their contextual significance. Additionally, it aims to contribute to a more comprehensive understanding of cultural and functional roles in historical contexts.*

Keywords: Archaeozoology, Knuckle-Bones, Astragalus, Early Historic, Kshatrapa Period, Gaming Pieces, Vadnagar

Introduction

India has a rich and enduring tradition of board gaming, as evidenced by the prolific discovery of game-related artefacts across the subcontinent. This archaeological record reveals a culture deeply invested in games of chance and strategy, with a diverse range of game pieces, boards, dices, and gamesmen unearthed from numerous sites. Among these finds, a relatively small but intriguing collection of knucklebones, or astragali, has emerged from the excavations conducted at Vadnagar between 2016 and 2019. Notably, this assemblage encompasses natural and deliberately modified specimens, dating primarily to the Kshatrapa period (1st - 4th century CE). However, before delving into the

specific analysis of these knucklebones, it is essential to establish the broader archaeozoological context of Vadnagar. By examining animal remains across different cultural periods, we can gain valuable insights into the local fauna, subsistence practices, and potential sources of materials used for game pieces, including knucklebones. This comprehensive approach will provide a solid foundation for understanding the role of these artefacts within the economic and environmental fabric of Vadnagar.

Animal Exploitation Strategies at Vadnagar

Archaeozoological analysis from Vadnagar provides valuable insights into the evolving animal-based subsistence strategies employed by the inhabitants. Over time, there is a discernible shift towards a more intensive and diversified utilisation of animals, reflecting a dynamic adaptation in their way of life.

During the first occupational phase at the site, the most important animals were cattle, buffalo, sheep, and goats. While sheep/goats seem to be valued primarily for meat, some cattle and buffalo were allowed to live until the advanced stage to exploit the secondary products. Almost all the skeletal elements of these animals were present, which suggests that some of the residents were raising these animals within the site. A small number of wild animals were also noted during this period. Period II revealed the presence of cows, buffalos, sheep, goats, and dogs. In this period too, secondary products of domestic animals were exploited. Wild animals were present during this period as well; however, as was the case during the first period, their contribution to the subsistence activities seemed to be marginal.

All the domestic animals in the previous two periods were also present during Period III. In addition, the domestic pig makes an appearance in the assemblage. The remains of two new domestic animals (horse and camel) also make their presence in the assemblage for the first time during this period. A good number of bones of wild animals have been recorded from this period. The highest diversity among wild animals was noted during this period. The most commonly hunted species were nilgai, spotted deer, blackbuck, four-horned antelope, wild boar, Indian hare and porcupine. In addition, birds, reptiles, fishes, and molluscs were also exploited for dietary purposes. Period IV revealed a general continuity in using domestic animals at the site. Similarly, all these animals were perhaps utilised for secondary products. Despite the change in the social structure, there seem to be no interruptions in the provisioning system of domestic animals. The animal management system during this phase appears to have been protected in such a way that major perturbations in the social structure made little impact on this system.

During Period V, the domestic animals present at the site include cattle, buffalo, sheep, goats, pigs, horses, and dogs. Similar to Period IV, the secondary products of cattle, buffaloes, and horses were valued significantly during Period V. Sheep were more than goats during this period, indicating the exploitation of sheep for secondary products like wool. A significant quantity of bones belonging to a wide variety of wild animals have

been uncovered. The most commonly hunted species were nilgai, blackbuck, chinkara, four-horned antelope, chital, sambar, barking deer, wild boar, Indian hare, and porcupine. In addition, birds, reptiles, fishes, and molluscs were also exploited for dietary purposes.

The domestic animals present during Period VI at the site include cattle, buffalo, sheep, goats, pigs, horses, and dogs. We notice an increase in the consumption of cattle and buffalo meat during this period. Similar to preceding periods, the secondary products of both cattle and buffaloes were valued significantly during this period. The other patterns were similar to those noted in the previous phase. Period VII yielded the least number of animal bones at the site. During this period, the domestic animals present at the site include cattle, buffalo, sheep, goats, pigs, and dogs. While the wild animals were still present, we saw a decrease in the number of bones of wild mammals.

What is an Astragalus?

The astragalus bone, also referred to as the talus bone, constitutes one of the bones within the ankle joint of mammals. The astragalus bone's name comes from the Greek word *astragalos* (plural *astragaloi*). At present, the most prevalent denomination worldwide is knucklebone (Holmgren 2002:212). This bone, compact and possessing a distinctive shape, resides between the tibia and fibula of the hind limb, as well as the calcaneus bone (known as the heel bone). Its pivotal function involves facilitating foot movement by transferring weight and forces from the leg, which is crucial during activities such as walking and running. In quadrupeds, it forms part of the hind leg, while in bipeds, it contributes to the structure of the heel (Cornwall 1956; Dandoy 1996) (Figures 1a and 1b). In most mammals, the bone exhibits a distinctive shape characterized by a combination of rounded and cuboid features. Its overall structure can be described as somewhat spherical or bulbous in certain regions, while other areas may appear more flattened or angular. Additionally, it features various ridges, grooves, and facets that contribute to its function in weight-bearing and movement. This unique morphology, in the form of having six surfaces, makes it suitable for making dice, and also likely explains the significant attention humans have historically given to this bone (Holmgren 2002; Koerper 2008:11).

What is the Significance of Astragalus? Why Astragalus?

Astragalus bones are commonly found in archaeological assemblages and often in well-preserved conditions. Their preservation can be attributed to their non-meat-bearing nature and their compact structure, which makes them resistant to various taphonomic processes. Consequently, these bones are typically found in higher quantities compared to other skeletal elements.

Unlike other foot bones that were often discarded during butchery, the non-meat-bearing astragalus was frequently selected for other uses (Lowrey 2014:7). In medium-sized mammals, such as sheep, goats, and most deer, the astragalus is about twice the size of modern dice and the shooter piece (throwing piece). This makes it an ideal size

and weight to be handled by humans in the various games that developed over the millennia (Dandoy 1996). Consequently, these bones were utilised to make various types of objects, as evidenced by archaeological assemblages from different parts of the world.

Figure 1a: Sheep and goats grazing in the vicinity of Vadnagar

Multifaceted Functions of Astragalus Bones: Evidence of Recreational and Ritual Practices Across Cultures

Astragali were sometimes used in their natural state as knucklebones, while others were intentionally modified. These modifications can be classified into two main groups: unintentional and intentional. Unintentional modifications include the smoothing of prominent bone features due to repeated use and handling (Minniti and Peyronel 2005). Intentional alterations involve smoothing or levelling the lateral and medial sides to enhance their functionality as dice, ensuring each side has an equal chance of landing face-up when tossed (Gilmour 1997). Other intentional modifications include drilling, burning, and incising (Holmgren 2002).

Modified Astragalus bones, used in various cultural contexts around the world, provide significant insights into ancient recreational and ritual practices. Astragali from the New Kingdom (c. 1550 – 1070 BCE) of ancient Egypt were frequently polished or etched, suggesting their use in games or rituals related to the afterlife (Wilkinson 1999). In Ancient Greece, modified knucklebones from Olympia during the Classical period (5th – 4th century BCE) were used in the game of "*astragaloi*," with modifications enhancing their functionality (Boardman 1978). Astragalus bones, both worked and unworked, have been unearthed in tombs and stratified layers throughout the ancient Near East, Anatolia, Cyprus, and the Aegean region from the Early Bronze Age (Gilmour 1997).

Studies on the Far West sporadically mention the utilisation of astragalus bones in recreational activities, which can be further classified into games and amusements for cross-cultural analysis (Roberts et al. 1959). At Tell Mardikh-Ebla in Syria, knucklebones dating from the Early Bronze Age to the Iron Age have been discovered, providing insights into their use in various cultural settings (Minniti and Peyronel 2005).

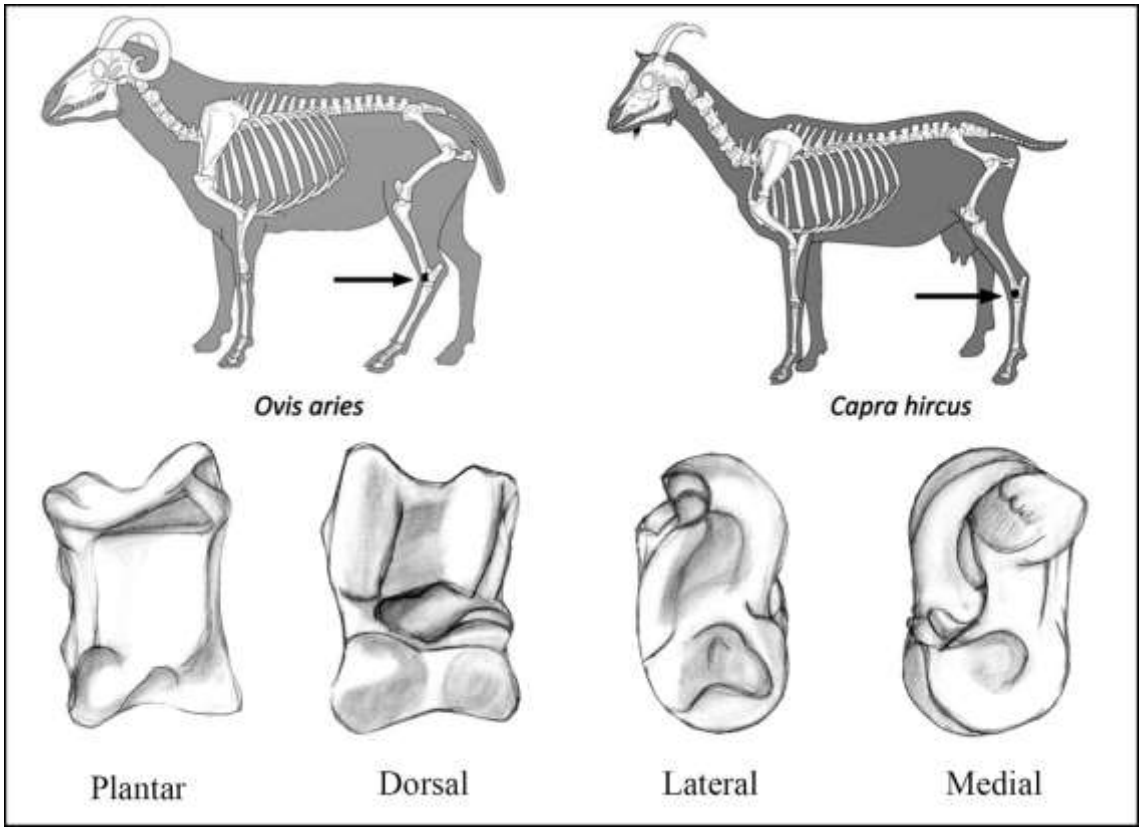

Figure 1b: Anatomy of sheep and goat showing the location of the knucklebone in its lower leg

A notable find from Ugarit includes a single knucklebone discovered in a pit near the Bronze Age Royal Palace. This knucklebone, originating from a cow, was filled with lead. Although initially interpreted as a game piece, Minniti and Peyronel (2005) suggest that its weight (280 grams) aligns with a local metrological system based on the shekel (9.4 grams), indicating that it may have functioned as a 1/30th shekel weight. In Room 406 of the Iron Age Western Complex at Tell el-Hammah, a substantial collection of knucklebones, dated to 10th century BCE was found. This room believed to serve a ceremonial purpose, also contained forty ceramic vessels, a moulded figurine, a terracotta amulet, a stamped seal, and gypsum (Cahill and Tarler 1993). A group of forty knucklebones, some of which showed modifications such as scoring and polishing, were dated to the eleventh/tenth century BCE (Iron Age IB/IIA) in Tell Miqne-Ekron's Field III (Gilmour 1997). Roman examples, such as those discovered in Pompeii from the first century CE, show polished and rounded knucklebones utilized for leisure activities (Benson 1986). Zhou Dynasty sites in China (approximately 1046 - 256 BCE) provided

modified astragali employed in games and divination rituals, demonstrating their ritualistic and recreational significance (Chang 1986).

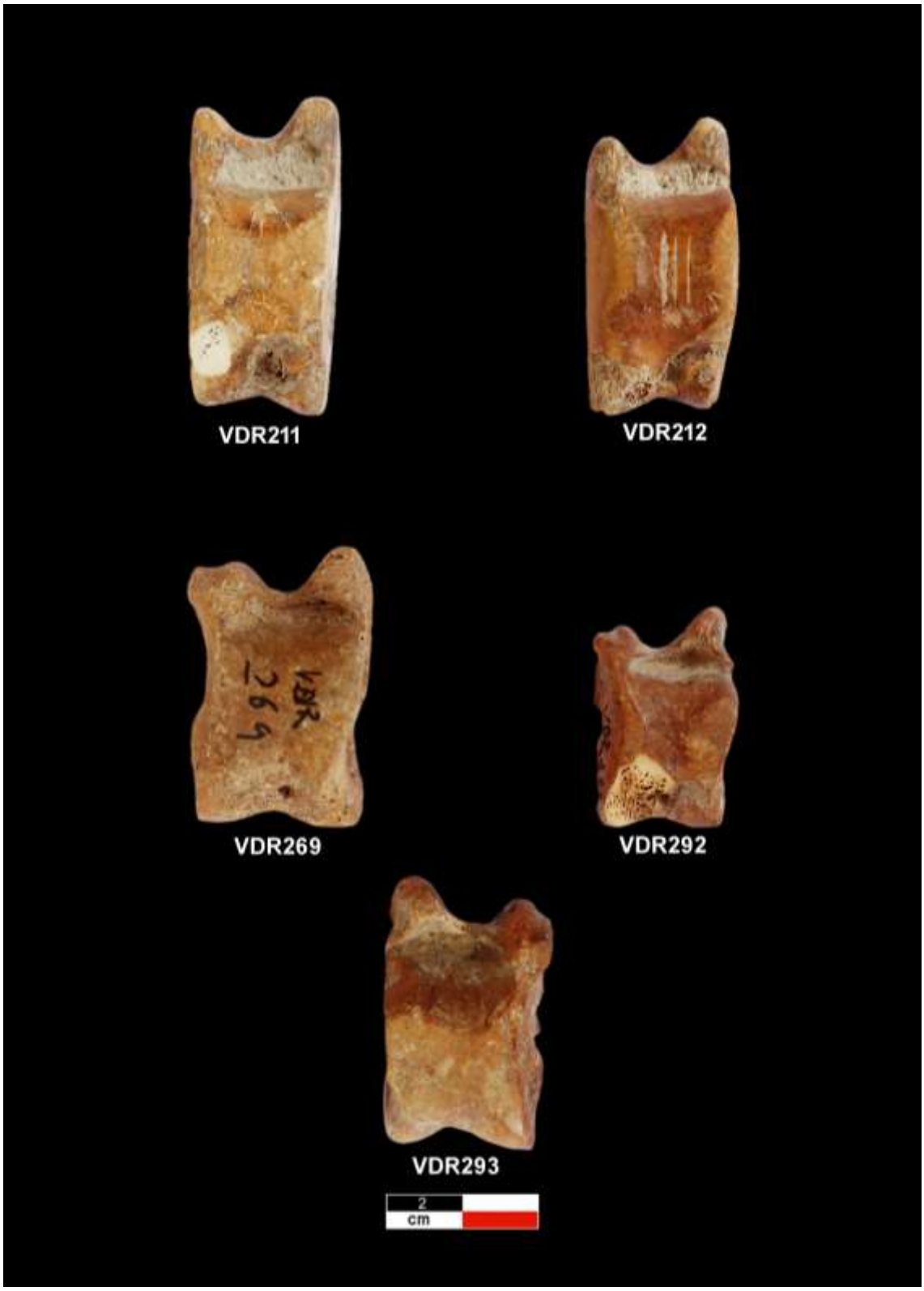

Figure 2: The plantar side view of worked knucklebones

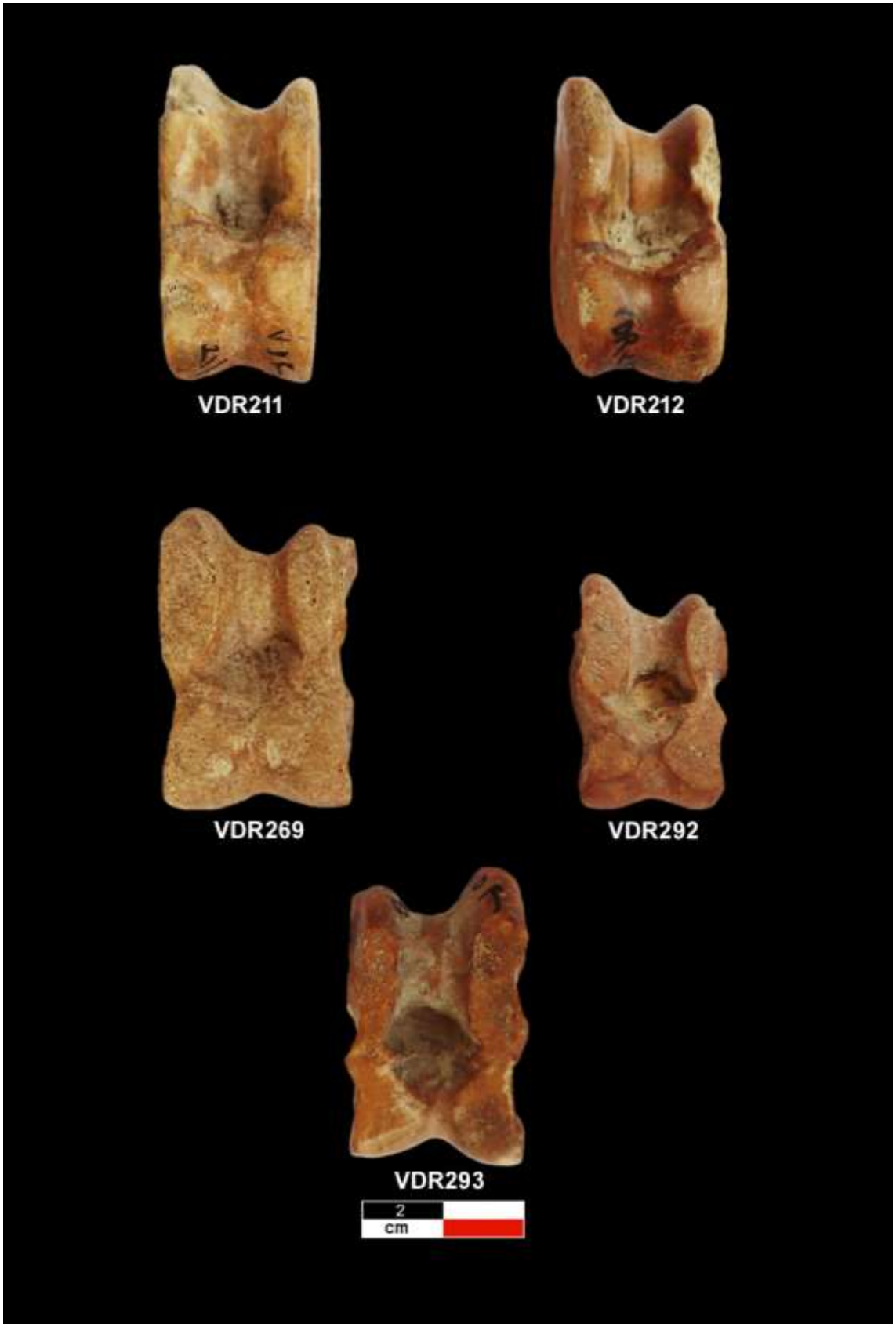

Figure 3: The dorsal side view of worked knucklebones

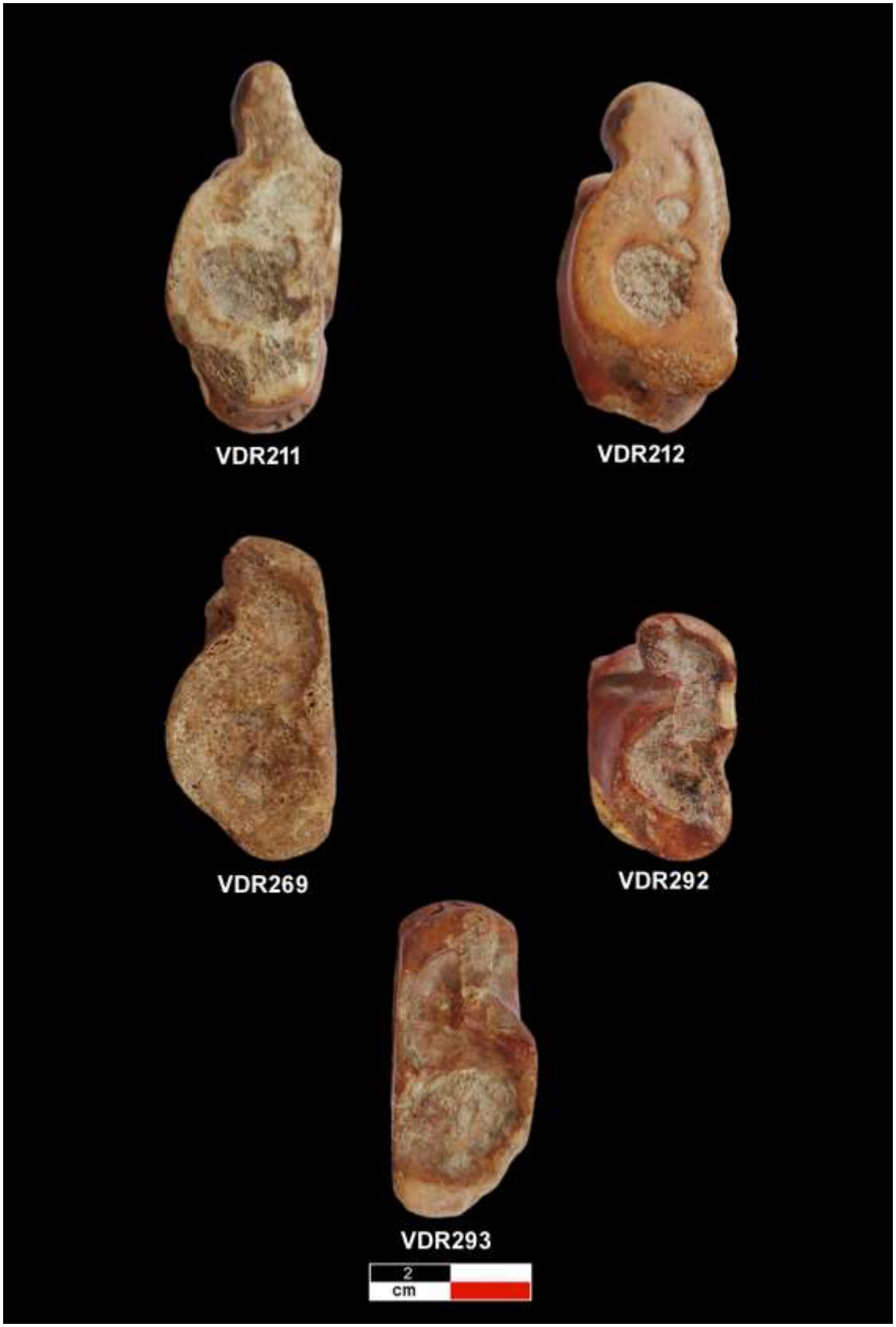

Figure 4: The lateral side view of worked knucklebones

Figure 5: The medial side view of worked knucklebones

The spatio-temporal distribution of knucklebone findings has led to varied and diverse interpretations of their function. These interpretations are often influenced by primary evidence from the largest collections. Astragalus or knucklebones are frequently

considered to be game pieces (Piccione 1980; Dandoy 1996, 2006), used in ritual activities (Minniti and Peyronel 2005; Gilmour 1997), as tools (Koerper and Whitney-Desautels, 1999), or as mediums of exchange or tokens (Holmgren 2002). While archaeological contexts may not always provide clear evidence of their use, there is ample historical and ethnographic documentation demonstrating a longstanding tradition of utilising knucklebones as game pieces across various cultures (Dandoy 2006). Patty Jo Watson (1979) contends that astragali games were played in locations in northern Iraq 7000 years ago and continued to be played in Iran. Many of the astragali found in the Near East and utilized as gaming pieces were obtained from domestic sheep and goats. He recognized astragali as gaming pieces or decorations if they met certain criteria: they were altered, found in larger groups than those in food remains, discovered alongside human remains in ceremonial graves, or present in quantities not typical of other mammal bones, including human wax (Dandoy 1996).

While astragalus bones quite frequently occur in faunal assemblages in the Indian context, the occurrence of modified astragalus bones is quite rare. They have been reported from very few sites and even in those sites, a detailed description of the same is missing. For instance, several sites of the Harappan Civilization (circa 2500 - 1900 BCE) have been reported to reveal knucklebones with smoothing and flattening modifications, indicating their use in games or rituals (Kenoyer 1998). Likewise, a limited quantity of modified knucklebones has been recorded from the sites of Rang Mahal and Taxila. They are believed to be used in a game akin to dice, albeit with two of their surfaces being round and the remaining four flat. Work with markings that correspond to the numbers one opposite six and three opposite four on the four flat sides. The specimens obtained from Rang Mahal are smoothened on both the upper and lower surfaces and are from a small bovid. They date back to the late Kushan period (Ghosh 1989: 180).

Archaeozoological Examination of Astragalus Bones from Period III at Vadnagar

A total of 13 astragalus bones from medium-sized mammals were recovered from the excavations conducted at Vadnagar during the 2016 - 2019 field seasons. These bones date to the Kshatrapa period, spanning from the 1st century CE to the 4th century CE, and were discovered in Locality C, located along the southern fortification. The specimens were found in layers 18 to 20, which contained ash, charcoal, brickbats, and pottery. These layers are associated with the initial phase of the Kshatrapa period's brick wall, situated on a well-prepared earthen rampart bed. The dispersed nature of these bones within the stratified context suggests that they were not buried together or were isolated from other animal remains, indicating their placement in specific structures or contexts separate from general faunal assemblages. This contextual evidence supports the idea that the extraction of these bones was intentional and related to their functional role within the site's activities.

Among the 13 astragalus bones, five were identified as worked knucklebones, while eight were unworked. Most of the bones were intact, though some unworked specimens

exhibited poor surface conditions, likely due to post-depositional events or the wear and tear associated with knucklebones. The identification of five knucklebones that were meticulously worked indicates deliberate human modification for specific purposes. The smoothing, polishing, and flattening of the bone surfaces on all sides demonstrate a high level of craftsmanship and attention to detail, suggesting their probable use as gaming pieces. Due to the lack of clear morphological features, identifying these modified bones at the species level was challenging (Figures 2 – 5). Hence, these were recorded as belonging to the medium-sized mammals. However, the unworked bones were identified as belonging to sheep/goats and blackbuck, indicating the possibility that the worked astragalus bones might also belong to these species.

Both the worked and unworked astragalus bones were subjected to precise measurements using a Digital Caliper (OriginCal), adhering to the measurement protocols established by Angela von den Driesch (1976). The dimensions of each bone were recorded in millimetres to ensure accuracy. In addition to the dimensional analysis, the bones were weighed using a digital weighing scale to determine their mass. For the worked knucklebones, detailed photographic documentation was undertaken to capture the various types of modifications present. High-resolution images were taken of all surfaces of these bones to provide a comprehensive visual record of the modifications (Figures 2- 5). This photographic analysis aids in the thorough examination of the alterations made to the knucklebones and supports a deeper understanding of their use and significance.

Table 1: Dimensions of worked knucklebones (astragalus) from Kshatrapa Period at Vadnagar

Reg No.	Area/ Trench No.	Context	Species	GLl (in mm)	GLm (in mm)	Bd (in mm)	Weight (in gm)
VDR 211	YA1/72/85/1	Layer 18	Medium-sized mammal	36.88	33.80	16.23	9.41
VDR 212	YA1/72/85/4	Layer 18	Medium-sized mammal	33.98	31.77	16.51	10.05
VDR 269	YA1/72/85/4	Layer 18	Medium-sized mammal	33.96	31.22	20.26	8.90
VDR 292	YA1/72/85/4	Layer 20	Medium-sized mammal	26.92	24.41	16.19	5.41
VDR 293	YA1/72/85/4	Layer 20	Medium-sized mammal	33.17	30.87	19.56	9.06

GLl: Greatest length of lateral side; GLm: Greatest length of medial side; Bd: Breadth of the distal end

Table 1 provides the dimensions and weights of worked knucklebones (astragali) from Period III. Except for one specimen (VDR 292), all other specimens are of nearly identical size (Figures 2 – 5). As previously mentioned, species-level identifications for these specimens were not feasible. The specimen VDR 292 stands out due to its distinct size, which suggests the possibility of it belonging to a different species or a different population within the same species. The inability to achieve precise species identification complicates our understanding of these variations. Nonetheless, the size discrepancy highlights the potential for multiple species of medium-sized mammals to be utilised for crafting knucklebones during this period. Further analysis, including more refined morphological or genetic studies, could provide insights into the specific species and the implications of their use in the context of Period III.

Table 2: Kinds of modifications observed on the worked knucklebones (astragalus) from Period III at Vadnagar

Specimen No.	Type of Modifications				
	Smoothed	**Polished**	**Flattening**	**Any Metal Filling**	**Incisions**
VDR211	Yes	Yes	Yes	No	No
VDR212	Yes	Yes	Yes	No	Yes
VDR269	Yes	Yes	Yes	No	No
VDR292	Yes	Yes	Yes	No	No
VDR293	Yes	Yes	Yes	No	No

Table 3: Types of Modifications Observed on Specimen No. VDR211

Specimen No. VDR211	**Surfaces with modifications**
Plantar side view	It is heavily smoothed and polished near the interarticular groove, proximal triangular fossa surfaces, and on the ventral articular surface. It has three vertical cut marks or incisions near the ventral articular surface.
Dorsal side view	It is smoothed and polished near the trochlea's lateral ridge, trochlea's medial ridge, and the head surfaces.
Lateral side view	It is smoothed and polished on the lateral process surface and fibular facet.
Medial side view	It is heavily smoothed, polished, and flattened on the entire medial surface.

Table 2 enumerates the various types of modifications observed on the studied modified knucklebones. This table provides a comprehensive overview of the range of alterations, including smoothing, polishing, and flattening, among others. Following this, Tables 3 through 7 offer detailed descriptions of the modifications observed on each specimen. These tables systematically document the specific characteristics and craftsmanship techniques applied to each knucklebone, highlighting the intricate details and variations in the modification processes. The in-depth analysis in Tables 3 - 7 (also see Figures 2-5) allows for a nuanced understanding of the extent and nature of human intervention in

these artefacts, providing valuable insights into the technological and cultural practices of the period.

Table 4: Types of modifications observed on Specimen No. VDR212

Specimen No. VDR212	**Surfaces with modifications**
Plantar side view	It is smoothed and polished near the medial ridge and ventral articular surface. It has three vertical cut marks or incisions on the ventral surface.
Dorsal side view	It is smoothed and polished near the trochlea's lateral ridge, at the top near the trochlea's medial ridge, proximal ends of the head.
Lateral side view	It is heavily smoothed, polished, and flattened on the entire lateral surface.
Medial side view	It is heavily smoothed, polished, and flattened on the medial surface.

Table 5: Types of Modifications Observed on Specimen No. VDR269

Specimen No. VDR269	**Surfaces with modifications**
Plantar side view	It is smoothed and polished on the medial ridge, medial scala, and ventral articular surface.
Dorsal side view	It is heavily smoothed, polished, and flattened near the trochlea's lateral ridge, trochlea's medial ridge, and the head surfaces.
Lateral side view	It is smoothed and polished near the fibular and lateral calcaneal facets.
Medial side view	It is smoothed and polished adjacent to the medial tibial shelf and tibial stop.

Table 6: Types of Modifications Observed on Specimen No. VDR292

Specimen No. VDR292	**Surfaces with Modifications**
Plantar side view	It is smoothed and polished toward the lateral side and ventral articular surfaces.
Dorsal side view	It is heavily smoothed, polished, and flattened near the trochlea's lateral ridge, the lateral notch, the trochlea's medial ridge, the medial bulge at the collum *tali*, the medial groove, and the head.
Lateral side view	It is heavily smoothed and polished on the lateral process surface and near the fibular facet surface.
Medial side view	It is smoothed and polished adjacent to the medial tibial shelf.

Table 7: Types of modifications observed on Specimen No. VDR293

Specimen No. VDR293	Surfaces with modifications
Plantar side view	It is heavily smoothed and polished near the medial ridge, medial scala, and ventral articular surface.
Dorsal side view	It is heavily smoothed, polished, and flattened near the trochlea's lateral ridge, trochlea's medial ridge, column *tali*, medial bulge collum *tali,* and proximal ends of the head.
Lateral side view	It is smoothed and polished on the lateral process surface, near the fibular facet and at the ends near the lateral calcaneal facet
Medial side view	It is smoothed and polished on surfaces near the medial tibial shelf, the tibial stop, and its adjacent surfaces.

Table 8 presents the dimensions of unworked astragali recorded from Period III. These specimens were excavated from trenches YA1/72/85/1 and YA1/72/85/4. Most of these belong to sheep and goats, while two astragali from blackbuck were also recovered, specifically from Layer 19 of Trench No. YA1/72/85/4. The predominance of sheep or goat knucklebones in both trenches indicates the significant role these animals played in the faunal assemblage of the period. The presence of blackbuck knucklebones, albeit limited, suggests occasional hunting or utilisation of this species as well. The detailed measurements provided in Table 8 contribute to a comprehensive understanding of the size range and variability.

Table 8: Measurements and weight of Unworked knucklebones (astragalus) from Period III at Vadnagar

Specimen No.	Area/Trench No.	Period	Context (Layer)	Species	GLl (in mm)	GLm (in mm)	Bd (in mm)	Dm (in mm)	Dl (in mm)	Weight (in gm)
VDR209	YA1/72/85/1	III	18	Sheep/Goat	30.62	29.15	20.60	15.89	15.87	9.89
VDR217	YA1/72/85/1	III	18	Sheep/Goat	30.73	29.28	21.20	15.93	15.92	10.11
VDR256	YA1/72/85/1	III	18	Sheep/Goat	31.62	30.38	22.21	16.11	16.07	11.89
VDR257	YA1/72/85/4	III	18	Sheep/Goat	31.67	30.29	21.27	16.98	16.34	11.98
VDR258	YA1/72/85/4	III	19	Blackbuck	27.68	24.97	17.77	15.07	14.56	7.98
VDR281	YA1/72/85/4	III	19	Blackbuck	25.96	24.68	16.41	14.33	14.34	7.78
VDR287	YA1/72/85/4	III	19	Sheep/Goat	32.34	30.56	22.12	17.45	17.89	11.98
VDR298	YA1/72/85/4	III	21	Sheep/Goat	30.14	28.67	19.45	14.98	14.78	10.87

GLl: Greatest length of the lateral side; GLm: Greatest length of the medial side; Bd: Breadth of the distal end; Dm: Depth of the medial side; Dl: Depth of the lateral side

Discussion

The modified knucklebones recovered from Period III at Vadnagar provide compelling evidence suggesting their use as gaming objects. While these artefacts could have served multiple purposes, several key factors strongly indicate their role in gaming activities. Firstly, the separate recovery of knucklebones, both worked and unworked, from other skeletal remains of animals, specifically from Locality C (Trenches YA1/75/85/1 and YA1/72/85/4), suggests that they were deliberately set apart. This separation from the broader faunal assemblage implies intentional handling and indicates that these bones were not merely by-products of other activities but were purposefully managed. Additionally, there is evidence of the deliberate removal of these talus bones from the hind leg joints, which further supports their specialized use. The detachment of these bones, rather than their natural attrition, underscores their intended repurposing for specific functions.

Furthermore, the deliberate alterations noted on five knucklebones such as flattening, polishing, and smoothing the dorsal, lateral, and plantar/ventral surfaces comply with traits typical of gaming components. These surfaces are carefully shaped to a size that is comfortable for human hands, indicating that they are meant for rolling and handling easily. These alterations strengthen the case that these knucklebones served as gaming objects by making them for use in games of skill and chance, reinforcing the hypothesis that these knucklebones functioned as gaming objects. Moreover, there are indications of mild polish and light-crushing wear on high projecting surfaces, such as the proximal triangular fossa, the distal intracephalic fossa on the plantar side, and the medial ridge and head of the trochlea on the dorsal side. These characteristics imply that the knucklebones underwent impact or tumble wear, which is common for items used in outdoor games or on dirt surfaces.

While alternative uses of these modified specimens cannot be ruled out, the combination of intentional modifications, separation from other faunal remains, and evidence of wear consistent with gaming activities collectively support the interpretation of these knucklebones as gaming pieces. Further comparative studies and experimental archaeology can provide additional insights into the specific games played and their cultural significance, enriching our understanding of recreational practices in the period. It is also worth noting that evidence of dice first appears at the site during Period III. This contribution lends credence to the notion that gaming was an important part of everyday life during this period. The presence of both knucklebones and dice emphasises the variety of game practices and provides a more complete picture of the ancient inhabitants' leisure activities.

Conclusions

The widespread distribution of knucklebones across diverse geographical regions and historical periods challenges the notion of exclusive cultural diffusion as the sole determinant of their prevalence. It is more plausible that the inherent physical properties of the astragalus itself contributed to its significance as a culturally salient object in the

ancient Near East and Eastern Mediterranean. While cultural exchange undoubtedly facilitated the transmission of associated customs and beliefs over generations, the bone's intrinsic characteristics likely acted as a catalyst for its widespread adoption.

Ethnographic evidence supports the predominant use of knucklebones as game pieces. Lovett (1901) documented a global array of cultures, including Turkish, Arab, Persian, Indian, Native American, and European, that employed astragali in various gaming contexts. Children's games involving knucklebones have persisted into modern times in Europe, Australia, and Tasmania, often with adaptations using alternative materials. Contemporary practices in the Gordion region demonstrate the ongoing use of modified astragali in games, highlighting the continuity of this tradition. Ethnoarchaeological research in Khorasan, Iran, further corroborates the employment of sheep and goat knuckle bones in the game of "Bojul."

In the Indian context, while the specific role of knucklebones in ancient gaming is still under investigation, their presence in archaeological assemblages suggests a similar cultural significance. The discovery of both worked and unworked astragali at sites like Vadnagar indicates potential multifaceted uses, including gaming, divination, or personal adornment. A comprehensive understanding of the role of knucklebones in Indian society requires further exploration of associated artefacts and contextual data.

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