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Hunting The Bison: Trail of Bisons in Prehistoric Rock-art of India

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Abstract: *Bison is a commonly depicted bovine in prehistoric Rock-art of India. Genomic studies have revealed its pattern and manner of spread in India and from here to neighboring regions, along with contribution of Indian Gaur in genetic constitution of other bovine species, especially Mithun (*Bos frontalis*). Apparently, this scenario can be made more nuanced by collating the genetical picture with that artistically narrated in Prehistoric Rock-art. In this paper, an attempt shall be made to comprehend the differentiated occurrences of bison in Indian Rock-art, its multifaceted roles in prehistoric hunting-foraging societies, and supplement further material to the complex genetic prehistory of movement of Indian Bison, through a comparative assessment of four major prehistoric sites of Rock-art in India. The study would also try to exhibit the epi-genetic factors that affected Bison biology, as strictly gleaned from Rock-art evidence.*

Keywords: *Bison, Bovine, Rock-art, Bhimbetka, Prehistoric period, Hazaribagh, Isko, Kupgallu.*

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Introduction

The obscure dimensions of Prehistory are often enlightened by Prehistoric Rock-art (Agrawala 1965: 20), which gives evidence of not just hominid behaviour and belief-systems, but also of the flora and fauna of the times, which plays a critical role in comprehending activities and interactions of extinct, endangered or primitive forms of existent species. One of the most frequently depicted animals in Rock-art is the Indian Bison (*Bos gaurus*), considered to be the progenitor of majority of modern cattle breeds in India (Naik 1978). From India, it spread both East and Southwards, as evident from genomic sequencing. However, besides genetical data, another stream of information emanates from Prehistoric Rock-art throughout India. Here, we shall endeavour to analyze and supply evidence about the historic spread-patterns of bison across the length and breadth of India, which interestingly also exhibits differing manner of bovid-human interaction, ranging from contestation to domestication. As

we move out from Narmada valley, differentiation in the mode of existence of bison, and its role in prehistoric economy of hunting-foraging societies becomes more diverse. This bears much scrutiny on the issue of occurrence of changes in the genetical makeup and morphological and behavioral traits of a gargantuan bovine creature like Bison, along with the incorporation of bovines in multiple roles in hominid society, from livestock to an immaculate competitor.

Methodology: What is to be done?

Genomic research of Indian Bison has come of age in recent years (see Kamalakkannan et.al. 2020), though the corresponding Prehistoric Rock-art record has interestingly eluded elucidation, besides some stray honourable mentions (Neumayer 1993: 82; Kumar 2014: 32). We spell out the basic working structure of the paper herein, in order to induce thematic and structural alignment in the presentation and discussion of research materials, and subsequent inferences derived from thereof.

Firstly, the bio-ecological nature of human-faunal interaction will be discussed, with special emphasis on the nature of such action inferred from Rock-art, and contextually related to prehistoric populace. Since domestication commenced from Mesolithic, certain bovines, including Bisons, were used as livestock too. Thence, this elemental feature would also find expression in the discourse below.

Secondly, four prominent prehistoric sites- Bhimbetka, Chaturbhujnath Nala, Hazaribagh and Huligemma Kolla shall be briefly described, as they contain the most vital and significant clue regarding the presence of Bison in a well-dated period of time, and depict a variety of concordance between the bovine and its contemporary human populace.

Lastly, theoretical and inferential features from aforementioned ventures shall be brought together to make explicit the correlation that has oft avoided cognizance, but forms the prime imperative of this paper. The Prehistoric Rock-art sites selected for this study are obviously not the exclusive records of Bison's presence in the past, but have been selected herein for the noble endeavour on accord of some factual considerations- 1) they are the most ably documented, 2) their art-historical phases have been studied in great detail, which aid dating, 3) they have clear and categorical record of the art-historical presence of Bisons in one of their multi-period cultural record, and 4) they present a variety of hunting-foraging scenarios, which throw a flood of multifaceted light on prehistoric past.

Hominids and Fauna: a socio-ecological framework

While Sociology and Ecology respectively study human societal norms, community-dynamics, and interspecies communion, their poised overlapping could lend us much credible method with which we may work out significant modes and patterns of socio-ecological interaction of humans with their faunal surroundings. A synthetic model which may best bear upon this humble crusade is the Human-Wildlife Interaction Model (*here from*, HWI-M). Strength of this model lies in its ability to take both hominid and bovine behavior into account while delineating context of their interaction (Dickman 2000). While this model was primarily developed for wildlife management (Lischka et.al. 2018), the parametric structuration of the model is sufficiently broad, and could be used for evaluating prehistoric contexts as well. As Francis (2019: 21) attested- temporally prolonged symbiotic relationships can alter perceptions on both sides of human-faunal equation, and induct animals in novel cultural and economic roles (Wadia 1926).

Now, to state the model briefly, HWI-M is the result of two distinct, but interacting systems: social and ecological (Fig. 1). Although human and animal behaviors are the proximate drivers of HWIs, the context shaping those behaviors is defined by multiple, nested levels of external social and ecological influences and attributes of individual humans and animals. These systems overlap

spatially, and feedbacks among social and ecological drivers (represented by curved arrows in) are critical determinants of HWIs. Within the ecological system, wildlife activities are influenced by an admixture of internal and external factors occurring across hierarchy. These levels of decreasing organizational complexity range from ecosystems to individuals (Krebs 2001). At the broadest level of external influence, *ecosystems* are the interactions between organisms and their abiotic and biotic environment, and prescribe the nature, directionality and determine energy and nutrient distribution. At the next level, ecological *communities* determine interactions among species through processes such as predation and competition (see fig.2 for all interspecific interactions) further constraining the distribution and behavior of considered animals. The last echelon of external influence occurs at the *population* level, where local dynamics influence the abundance, density, survival, and reproduction of individuals, which strongly affect animal behavior. In addition to these external influences, *individual* behavior is an aggregative consequence of various individual attributes of animals. Attributes such as demographic characteristics (e.g., age, sex), reproductive status, physiological condition, social-status, temperament, previous experience, and genes can all shape animal behavior directly or indirectly (Davies et al. 2012). Somewhat similarly, human activities are affected by external and internal influences within the social system (Manfredo et al. 2014, 2016); Broadly, societal-patterns, such as language, culture, economic development, and human migration, shape the *context* within which people interact with the natural environment. *Institutions* and governance structures, such as decision-making authority, populace-based actions, public engagement, comprise the next level of external influence and critically influence people's common perceptions of decision-making processes, power, and resource-allocation. At the latest rung of external influence are *groups*, such as community-organizations and other affiliations with which people identify, impose and reinforce norms for acceptable behavior in relation to one's social and environmental surroundings. Individual behavior is also guided by various individual attributes, ranging from general (values) to specific (attitudes, personal norms) cognitive influences, as well as socio-demographic characteristics, emotions, previous experience, and genes.

Such consideration also plays a central role even in prehistoric societies, which are often labelled as 'primitive' (Burkitt 1923: 31), 'incipient' (Childe 1936:92), but were nevertheless equally complex in matters of organizational design and ritual-cultural mores (Roy 2010: 399). Human role in domestication process involved not just one-sided exploitation of the 'meek', but also included providing security against intra-specific rivals and interspecific predators by taking note of predators' behavior, physiology and their movement-patterns, and by further managing cattle behavior in relation to topography, climate, habitat-distribution etc. Different Rock-art centres show differential patterns of interaction and consequently, major differences in archaeo-cultural debris and community organization. Domesticated cattle in India makes first appearance in late Mesolithic period (Dhavalikar 2023: 499), and possibly allowed some select prehistoric communities to maintain their functionality till mid-Neolithic (Shinde 2006).

Bovines in India are mostly products of the domestication process that happened in Upper Indus Valley (Bredley 1996: 155), during the Early Neolithic period (c. 10,500 BCE). Differences between taurine (domestication hot-spot¹: North Levant, see Helmer et.al. 2005) and Zebu cattle are phenomenal, and appear along morphological, phenotypical, genetical and even behavioral lines of distinction (Kumar et.al. 2016: 86[12]). From its parent populace, Zebu inherited I1mt DNA haplogroup-type (Naik 1978; Baig et.al. 2005: 56). Another intense domestication event occurred in Gangetic Valley in c. 4000 BCE, which introduced I2 mt DNA haplogroup-type in Indian bovine populace (Magee et.al. 2014; Cheng 2010: 10).

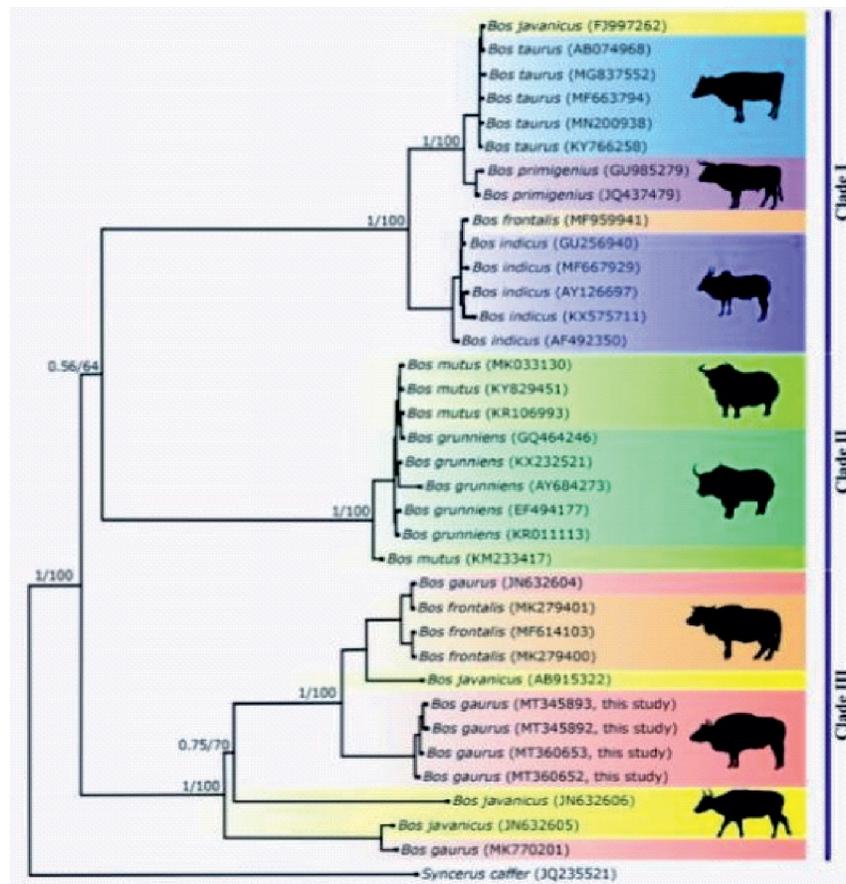


Fig. 1: Phylogenetic relationship of members of the *Bos* group, including Aurochs and Bisons (Kamalakkannan et.al. 2016: 10, fig.5)

It is believed that the two mt DNA groups migrated in different directions, with I1 moving Eastwards and I2 Southwards respectively, with the *point of split* located in Central India, precisely in close proximity of Bhimbetka (Francis 2015: 233). The role of Indian Bisons was of critical significance in this genetic prehistory, for it was definitely used as one of the parents (mostly masculine for greater sturdy body-frame). Here, Rock-art evidence presents a unique perspective, for it seemingly gives a registered archaeological record of how Bisons were looked at by Prehistoric human communities, how it was hinted, and most importantly, how it was brought into differential uses, especially in creating advanced genetic hybrids to serve human needs.

The artistic expression of faunal elements of Rock-art shows numerous moods, differing from straightaway danger to prescient interspecific symbiosis (Kumar 2014: 58). Depending upon situational and temporal factors of activity, hominid responses ranged from awe to veneration, sometimes even evolving into a bovine cult, as evident from Neolithic strata at Çatalhöyük (Francis 2015: 234), with the latter feat generally becoming emergent after domestication and gradual accommodation of bovine cattle near human settlements (Bahn 2010: 99), and their subsequent integration in the processual apparatus of enhancement of human life potency and expectancy (Diamond 1997: 225). Zeder (2006: 228f.) proposed a simple sequential model of Domestication, wherein some members of a particular animal species, as a consequence of 'relaxation' of natural selection on accord of their entrance in human habitat, were selectively bred with tamed, docile members of closely related species (ex. Zebu Bull with Indian Gaur), followed by reproductive isolation by selective interspecific breeding (Kumar et.al. 2016: 12). These newly tamed cattle were judiciously protected from their wilder counterparts,

on account of both their relatively weaker stance against latter, and prevent ‘feralization’ (Zeder 2006: 52). The domesticated, along with the tamed and cross-bred were both ‘exploited’ for dairy foods and nutrients, and ‘conserved’ for ensuring survival in times of scarcity (Renfrew & Bahn 2015: 208). Production of milk by domesticated cattle helped humans in three ways: 1) milk could act as an all-round source of food, 2) calcium in milk provided necessary nourishment to human infants, as exposure to sun would have invited both sunrays and view to predators/rivals, and 3) water in milk could have been extracted to quench thirst in times of drought (Gerbault et.al. 2011: 155). Here, in order to ‘craft cattle’ with requisite traits, free-roaming Bisons helped prehistoric hunter-gatherer populations, while it’s graduated utilization resulted in lactose-persistence mutation in Northern India (Romero et.al. 2012: 98). Thus, in a way, while the genetic role of Bisons was secondary to an extent, their participation in sustaining hominid social-groups and influencing their art was primary by all means and measures (Sonawane 2023: 501).

BHIMBETKA

The Cave paintings in the caves and rock-shelters of Bhimbetka (Abdur-Rahmanganj, Madhya Pradesh), present a spectacular marvel, witnessing which is a wondrous experience, one that unceasingly and unfailingly awes us and makes us flummoxed (Carllyle 1885: 23). Since then, several scholars have time and again explored the site.



Fig. 2: A Rock painting, depicting ritual hunt of a pregnant bison from Zoo Rock, Bhimbetka (Source- Wakankar 1976).

One specific cave-painting from Mesolithic² Bhimbetka holds immense but mysterious significance, on account of the shortage of its artistic analysis in conducted studies, and its positional placement in the multimodal canvass of Zoo Rock, labelled C-III 50 in Archaeological reports (Misra 1985: 66). The site is starkly different from other cave-paintings at Bhimbetka, due to its continuity across boulders and obsessive focus upon hunting scenes (Mathpal 1984: 89). Here, in the cave-painting visible above (see fig.02), we have our prime example from Bhimbetka. On close observation, one can categorically distinguish between animal and human figurines, and also concentrate on their relative size and space allotted on the rocky canvas. The color used herein, red, is certainly made from ferrous or hematite held in abundance by mineral ferric ores in the surrounding terrain (Wadia 1926: 22). The

animal figure is identified by some scholars with wild buffalo (Hasnain 1992: 78), or more accurately, a female bison (*Bos gaurus*) (Misra 1978: 56), with her young calf, while the ‘mother bison’ appears expectant. Humans cover the bison linearly, obviously overjoyed and gleeful with the potential meal of the day. Functionally, this illustration fulfills the- *Communicative* (daily mores of hunting-gathering), *informative* (group strategy to trap target, and probably the best time to do so), *recreational* (customary dance on such festive occasion), a social (prowess of collective stance) functions quite significantly.

Neuro-aesthetic analysis tells a tale of mirth (see Ramachandran 1998, 2010). When analyzed cautiously, one may find deliberate deployment of some principles of Neuro-aesthetics. The unusual size of Bison severed it from conventional paintings (*peak-shift*), its rather abstract delineation required much cognitive effort (*problem-solving*), arrangement of associative human figures in clustered patterns further enhanced its aesthetic quality (*perceptual-binding*), differential size of hominids and bovid creates *Contrast*, while it’s off-track location atop stone builder that requires physical exertion *Isolates* it from the rest. Conclusively, the degree of aesthetic immersion induced immediately makes this struggle with a female bison stand out. Besides, thematic delineation reveals an interesting belief of the residents of Bhimbetka- the survival of the calf. A common belief among many tribal people is *cosmic balance of nature*. While some specific animals were widely hunted, their decimation never attained definitive absolution, i.e. some younger members of the preyed species were permitted to ‘live and prosper’. This reflects a normative construct, and close integration of Bhimbetka community with surrounding nature (Singh 2024: 175). It also shows an attempt of social-groups to *diversify* their food-resources, with hunting focus later fixed on some other species as well, such as buffalo, wild ox etc. (Kumar & Pradhan 2008: 118).

While Wakankar (1976: 34) earlier speculated it to be a ritual ceremony for the performance of fertility rites, the presence of an arrow stuck on the left forelimb of mother bison gives it a thematic format that primarily depicts hunting. Hasnain highlights the magical function performed by this illustration. Bhimbetka played a major role in domestication of *B.p. namadicus* (Badam 2024: 81), and probably stood as the centre point of dispersion of somewhat tamed bovines throughout the subcontinent. As glimpsed above, Mesolithic hunters of Bhimbetka initially hunted Bisons ferociously, but also with ritual sanctity. Gradual repetition of similar behavioral interaction resulted in expansion of utilization-potential of Bisons, some of them possibly used in cross-breeding (Badam 2000: 11). This frame of action concurs well with the *prey pathway* of domestication, as proposed by Zeder (2012: 218), where management strategies of controlling prey behavior get substantially transformed into regulation of cattle³.

CHATURBHUJNATH NALA

The next Rock-art centre which sheds a flood of light on prehistoric life of Bisons in India is seemingly a north-eastern neighbor of Bhimbetka. Located in Gandhisagar-Bhanpura region in Chambal Valley, it emerged on prehistoric map of India through the arduous efforts of Y. Mathpal (1984: 56), who only tangentially captured the importance of the site. Kumar (2007: 124) extensively explored and carefully recorded major rock-paintings through sketches. Later on, Kumar & Bhatt (2008: 64ff.) studied the neighboring socio-cultural landscape, and found many surprising artistic, ritualistic and culture continuities amongst the quotidian habits of local tribal people, mostly Gonds (Misra 2023: 76). Ethnographic parallels have helped scholars comprehend communicative and thematic functions of certain obscure and esoteric materials in Rock-art. Reasons behind creation of Rock-art at Chaturbhujnath lurk in shadows, and unless strong evidence of practice or unwavering socio-cultural continuity gets in hand, all theories would not be more than conjectures and speculations.

However, ethnographic investigations have helped in clearing some fog. Intentionality shines when portraits similar to rock-paintings are observed in daily community life. With similar ecological and institutional factors intact, a direct (though much tempered) inference can be drawn from existent practices.

The ecosystem of Chambal Valley has remained more or less the same since start of Mesolithic era (Wadia 1926: 133), with occasional flood depositions during Late Neolithic (Fagan 2008: 50). Institutional and social factors have molded cattle use primarily for rearing and transportation functions, (Quadri 2020: 26), with minimal social mobility, this area being designated as the ‘backwater of History’ (Dani 1986: 88). But, active hybridization has not untouched this tract. Being in proximity of pioneering residents of Bhimbetka, this area also received either stimulation from or actual product (tamed cattle) from the latter. Cultural occupation here has been divided into two periods- Mesolithic and Neolithic-Early Historic.

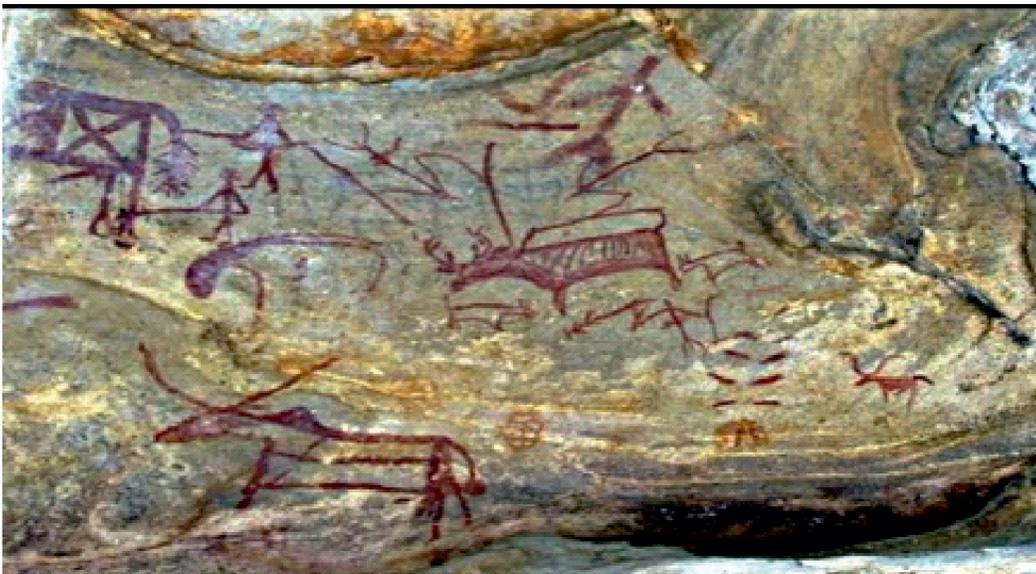


Fig. 3: Hunting of Bisons (slightly effaced) at Chaturbhujnath Nala (Source- Wikimedia Commons).



Fig. 4: Hunting and Commuting in Prehistory using Bisons as drought animals (Source- Wikimedia Commons).



Fig. 5: Two Bisons standing in full frontal glory, probably during an act of herding (Courtesy- Purakala 2007).

From the study of Bisons at Chaturbhujnath, one may clearly sense a paradigm shift in worldview, from hunting-exploitation to an apparently ‘Naturalistic’ one (Oetelaar 2014: 98). The initial view finds expression in Fig.03, where we witness an aggressive hunting scenario. Drawings are only stylistic, and rely more on geometric shapes and patterns. While Kumar (2007: 214) dates such drawing style to Neolithic, Chakraborty (1999: 299) places this style to Mesolithic period in a general pan-India chronological arrangement, and Mathpal (1984: 42) places the concerned style again in Mesolithic, though only for Bhimbetka. On general consideration, it is better to place this painting in Mesolithic⁴. From a Neuro-aesthetic viewpoint, *perceptual-binding* focuses on connecting hunter-hunted/captured game together, while *contrast-extraction* creates a differential in size in order to possibly emphasize on the ferocity of ‘conquered’ Bisons. However, when we move to Fig.05, hunting theme has been replaced by a glorious frontal perspective where two full-grown Bisons are seen standing, which we may claim to be an expression of their docile/tamed state based on some observations- 1) the orientation of neck, which shows a combination of submissive and confident cattle approach (Schloeth 1961: 28), 2) position of Bisons in an apparently cattle-reminiscent pose, and that showing movement. Neuro-aesthetically, the painting pays close obeisance to *isolation* for greater contextual focus, and *generic vision*, which probably shows the prolonged experience of the paleo-artist in witnessing this posture of cattle. Possibly, following the ‘prey pathway of domestication’, Prehistoric humans at Chaturbhujnath became indulged in herding management, though definitive evidence is in want. A firm resolve in this direction can be developed safely based on Fig.04, where Bisons (on basis of similarity of execution and outline) have been deployed in commuting endeavours, and *contrast* shows the human chief (?) more predominantly than the bovine creature. Docility and domestication encompass this painting fully. The paradigm shown tilts towards ‘exploitative-frame’, with absolute hominid control over Nature, and it is very probable that these tamed Bisons, following the first wave of bovine dispersion from Bhimbetka, acted as it’s sequel. Inter-community exchanges in form of trade, commerce, batter and periodical makeshift markets facilitated transmission of both cattle-management strategies and domesticated breeds. This would have helped the recipients either in initiating domestication process or using obtained domesticated varieties in expanding their own economic potential. These observations make this painting a relic of proto-Early Historic period, slightly earlier before regional chiefdoms were emerging to become *Janapadas*, a process that saw its finale in c. 6th Century BCE (Lahiri 2018: 16).

HAZARIBAGH

This site is of immense significance, as it holds the key to understand the prehistoric movement of Bisons in Eastern India, the rise of Mithuns, and second Bovine domestication event in South India. While scholars for long have suspected the involvement of Bisons as a parental breed of Mithuns, archaeological and genetic evidence has been confounding at best. Hazaribagh offers a unique, though distant clue, while also narrating the arrival of Bisons in South India.

From Narmada Valley, Bisons moved in two opposing directions- East and South (Naik 1978). Hazaribagh serves as a second component of this directional transmission after Bhimbetka. Located in Jharkhand, Hazaribagh has many Rock-art sites, with Bison making appearances at Isko, Thengpi, Nautangwa etc. (Shekhar 2023: 328). Most of the sites belong to late Mesolithic and Early Neolithic cultural complex. Hazaribagh rock-paintings are located in the peripheral regions of Chhotanagpur plateau. The most prominent and researched site is that of Isko (23°48'20.22" N; 85°19'40.19"E), which is often considered as the 'gateway' to the undulating tracts of further east. A semi-evergreen and mixed deciduous forest primarily comprising Sal (*Shorea robusta*) trees covers the hills, while the Damodar River is about twelve kilometers from the site. Isko village geologically forms part of the Karnapur Valley, which is characterized by lithic elements of the Gondwana system (Wadia 1944). Karnapur Valley is marked by lush grasslands, long hill ranges, fold mountains and moderate escarpments (Biswas et.al. 2023: 57). This area is home to Gonda, Oraon and Munda tribes (Chaudhary 1957: 19; Hasnain 1992: 184).



Fig. 6: Bison figure painted on Section D of Isko Rock-art Cave
(Source: Biswas & Bain 2021: 179, figure 7)

The first archaeological and anthropological survey in the Hazaribagh region was done by S.C. Roy in 1928 (Roy 1957), who documented the lifestyle, settlement pattern, art, culture, dressing customs and hunting-gathering practices of Munda, Birhor and Oraon communities and explored several prehistoric sites in Hazaribagh district. It was Father Herbert, a local Christian missionary, who discovered Isko site in 1992. Later, Mr. Bulu Imam, a local INTACH Convener, further researched Isko in great detail (Imam 2014). Chakraverty (1999: 233; 2003: 40) discovered many microlithic tools and some paleolithic hand axes. Neolithic cultural stratum was also present, but with limited



Fig. 7: Bison amongst a hominid crowd, Nautangwa (Source- Wikimedia Commons)

polished stone-tools, which indicates that either Neolithic cultural complex did not develop to its full potential, or the duration of residence of prehistoric communities was constrained by hitherto unknown factors (Pandey 2012: 89). Settlement-patterns at Isko and in neighboring villages shows influx of populace from Central India, which could be on account of both actual migration of people from the latter to former, or on accord of ethnological intermixing of tribal communities, since many tribes like Gonds are spread over a vast region, and enjoy considerable demographic presence in Orissa, Madhya Pradesh, Chhatisgarh and Jharkhand (Hasnain 1992: 154; 2015: 89).

Hazaribagh rock-paintings present an unparalleled glimpse into the cultural life of prehistoric communities. At Isko, most of the Rock-art is concentrated in Khovur-gufa, where Bisons are located in Section D of the major rock. The painting shows a singular bison, in profile, drawn using hematite material, though at present only its body-contours/outlines are visible. The inner abdominal section shows transverse, zig-zag lines which possibly exhibit the rumination process. This might suggest a domestic outlook, given the degree of attention. While this would have been possibly true for Isko, the neighboring Rock-art site of Nautangwa depicts a wild, somewhat feral bison possibly attacking a hominid settlement, and being diverted by human figurines represented with contorted bodies. Even though Gaur was domesticated early, the process of bio-cultural transformation was neither irreversible nor watertight, and generally tamed, separated bovine populace reverted back to feral style as a result of mating with wilder counterparts.

Neuro-aesthetic grounds also posit revelatory insights. In fig.06, one may witness clear application of the principles of *Isolation* (unit record of creature in painting) and *problem solving* (clear delineation of both outline and innards of bison for clarity), both of which together blend and unionize the bovine-human interface, asserting that possibly the painting was part of enactment of ritual activity, given the long association of Gaur with virility and strength (Naik 1978: 12). Fig.07, on the other hand, shows use of *perceptual binding* (humanoid-figurines placed in proximity of bison) and thematic *contrast-extraction* (difference in delineation of bison and human figures), the latter of which extols exclusion, and emphasizes on the feral nature of the bison.

It is known that before or during early years of c. 1st millennium BCE, a significant part of local people migrated to Northeast, a prehistoric event majorly responsible for introduction of Munda elements in latter region's lingua franca (Hazarika 2019: 55) and ethnic composition (Hasnain 1992: 160; Basu Roy 2010: 461). Law (1954: 72) believed that the wide applicability of the term 'Kirātas' probably refers to this highly diverse social-group comprising people from multiple cultural centres. Through the Myanmar route, Bisons moved from confines of Indian subcontinent to South East region (Kumar et.al. 2016: 10). From this, it would not be patently impossible for Bisons to move to Northeast Indian states, especially the ones neighboring Bangladesh, Bengal and Bihar (ex. Mizoram, Manipur etc.), and from here to further north-east. Genetic ancestry and speculation of Mithun has remained long riddled and unsolved. Three hypotheses prevail- 1) Mithun directly descended from Gaur, 2) Both share somewhat similar genetics due to epi-genetic reasons, and 3) Both have a common ancestor, a wild bovine which later became extinct. PCA analysis creates a tri-modal segregation, with differentially admixed sub-population with Tho-tho cattle and gaur comprising SP1, Mithun of Arunachal Pradesh and Nagaland SP2, and Mithuns of Mizoram and Manipur SP3, though genetic heterozygosity posits proximal relationship between gaur and SP3 (Mukherjee et.al. 2022: 56-60). Certain bottleneck events were also recorded for gaur population, which points towards their graduated translocation to a bio-geographically 'foreign' region, an obvious consequence of migration. Thus, we may assert, though tentatively, that wild (though somewhat tamed, but not domesticated fully) were used either to translocate goods or people from Hazaribagh and neighboring culture-areas when they went from Chhotanagpur plateau to Rajmahal Hills, and from there to North-east Indian states, leaving behind an unbroken trail of Bison rock-paintings from Hazaribagh to Chhatra, Gaya etc. While Northeast states have unveiled no considerable Rock-art examples, the tracing of a continuous chain of bison, as the only bovine common to Rock-art centres, makes it plainly evident that wild gaur acted as the ancestral species to Mithun, as also posited on the basis of a re-examination of genetic evidence (Prabhu et.al. 2020), which in a definitive way, lends a confirmatory nod to our hypothesis.

Also, it is highly probable that the same social-groups moved Southwards, carrying Malwa cultural constituents to mix with Jorwe culture (Pandey 2012; Singh 2024: 189). We would not be wide off the mark in speculating, with caution, that this eventual transmission of people and culture across horizons possibly also meant a movement of Bisons and other cattle in South. The temporal and spatial correlation of this event with the emergence of a new, secondly domesticated variety of Zebu Bull in South India should disapprove any notion of speculation and remove support from theories implying involvement of taurine cattle from Africa and Near East in the process concerned. We would like to argue, based on genetic and Rock-art evidence, that the primary factor behind the punctuated genetic diversity in zebu of Southern India is primarily due to the variegated role played by both the wild and tamed varieties of Indian Bison.

HULIGEMMA KOLLA

Rock-art in South India is still a nascent subject (Joglekar 2014: 82), though efforts are being assiduously to put to record rich art-historical evidence as gleaned from study of rock-paintings. Thence, our inspection becomes structurally delimited by want of both data and analysis. However, sufficient hard evidence is at hand to get a brief and working idea of the interrogation ships amongst variables of our concern herein.

With the movement and migration of people, their related bovines (in varying stages of Domestication) also moved with them. With this started the process of bovine domestication in South India, which ultimately led to exponential increase in genetic diversity of bovinds. Southwards, Bisons

probably branched into two directions, with one reaching Goa and Karnataka in East, and Tamil Nadu (Sanjeevi Hills, Kovanur etc.) in West. These sites exhume a hunting relationship between humans and Bisons, which, with change in socio-economic and bio-cultural conditions, tilt towards becoming more 'homely' (Sankalia 1964: 51).

Huligemma Kolla (15° 339 N - 75° 46533 E: Elevation (AMSL) - 574 m) is located about 4 km north of B.N Jālihaḷḷa village and to right of the foothill of Huligemma (the Village deity) temple. The vertical side of the large rectangular wall (where our Bison is located) is a possibly Early Medieval carving of lord Hanumāna. To the left of the deity there are petroglyphs (Mohana 2023: 88; 2017: 162). The site presents Bison in a style never seen afore. With 12 other animals, including deer, antelope, wild boar, two decorated Bisons participate in the serene natural scenario. Interestingly, artistic emphasis on Bisons here does not use any characteristic Neuro-aesthetic principle, such as contrast extraction, which makes Bisons part of the 'scene of nature' depicted (Ramesh 1984: 221). The positioning of this rock-painting is also quite interesting. It shows a performative ritual possibly to appease and, with naturalistic exactitude, depict such phenomenon for supernaturally 'effecting' natural forces (Hasnain 1992: 89). Also, the painting could also be construed as a representation of a 'completely tamed, docile and domesticated' variety of Indian Bison (Mohana et.al. 2017: 78).



Fig. 8: Hunters chasing a bison, with one hominid atop the enslaved bison (Courtesy- Times of India).

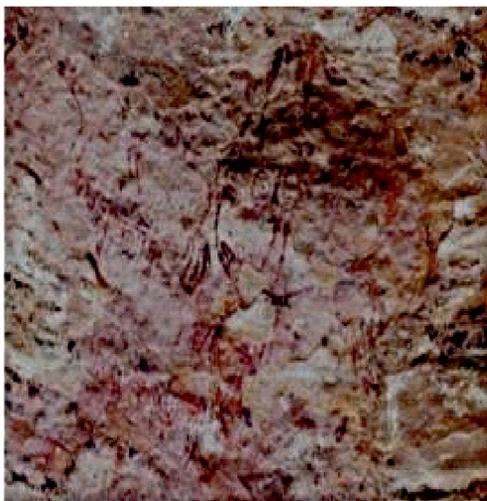


Fig. 9: Bison (right) along with an unidentified animal from Kovanur (Source- Wikimedia Commons).



Fig. 10: Depiction of Bisons along with other animals at Huligemmma Kolla, Karnataka (Courtesy-Mohana 2015).

Here, the role of a domesticated bison becomes immensely significant in countering an old notion in the discipline of bovine genetics. Baig et.al. (2005: 185ff.) examined mt DNA of gaur and Zebu cattle from South India, compared the dataset with that collated for taurine cattle from Europe and Near East, highlighting greater genetic diversity of the latter. This, in their learned opinion, suggests arrival of Dravidian languages and cultures from Near East, due to the presence of an Elamite substratum in Dravidian lingua (Ruhlen 1998: 44). The greater nucleotide diversity of Zebu cattle DNA needs to be considered too, for two strains of genetic make-up of South Indian Zebu cattle suggests lengthened ancestry that traversed Indian subcontinent. This line of reasoning is further configured in the genetic mutation that effected Zebu cattle in South (Naik et.al. 1969). The role of Bisons in the emergence of Zebu cattle is further evident from fact that Y chromosome of both Bisons and zebu is acrocentric, unlike that of Taurine, which is sub-metacentric (Ying & Peden 1977: 1761).

Chen et.al. (2010: 550) present an interesting picture. Indus Valley is a definitive and assured centre of bovine domestication, based on compelling Archaeological evidence, and three other factors- 1) complete identification of a well-developed backbone structure of speciation networks, 2) multiple unique haplogroup-types concentrated in a particular region, and 3) identical multimodal mismatch statistical values, significantly favoring domestication when compared with Gangetic Valley and South India. These three factors make Indus Valley region home of I1 haplotype, though the story is complex for I2. Gangetic region reveals an intermediate haplogroup-type labelled I2a. Also, I2 is that least widespread genomic configuration, and time-expansion series reveals it came into existence around 5,000 YBP (= c. 3200-3000 BCE), followed by another intensive recruitment of wilder bovine species, a phenomenon occurring in Late Stone Age and Early Iron Age of South India (Fuller 2006), an interesting fact as it strongly collated our multidirectional migration hypothesis (see Hazaribagh section) developed afore. We would like to cite one additional supportive evidence. Shrivastav et.al. (2014: 1065) described the haemoglobin type of Indian Bison as 'characteristically similar to American bison for a considerable range'. Harris (1973: 255), based on hematological studies, labelled it as Hb-b type. Zebu cattle in regions with mild temperatures and equitable rainfall mostly have this haemoglobin. Though, when we move away from equator and in arid regions, with marked seasonal scarcity of water, Hb-a type becomes predominant (Naik et.al. 1969: 29).

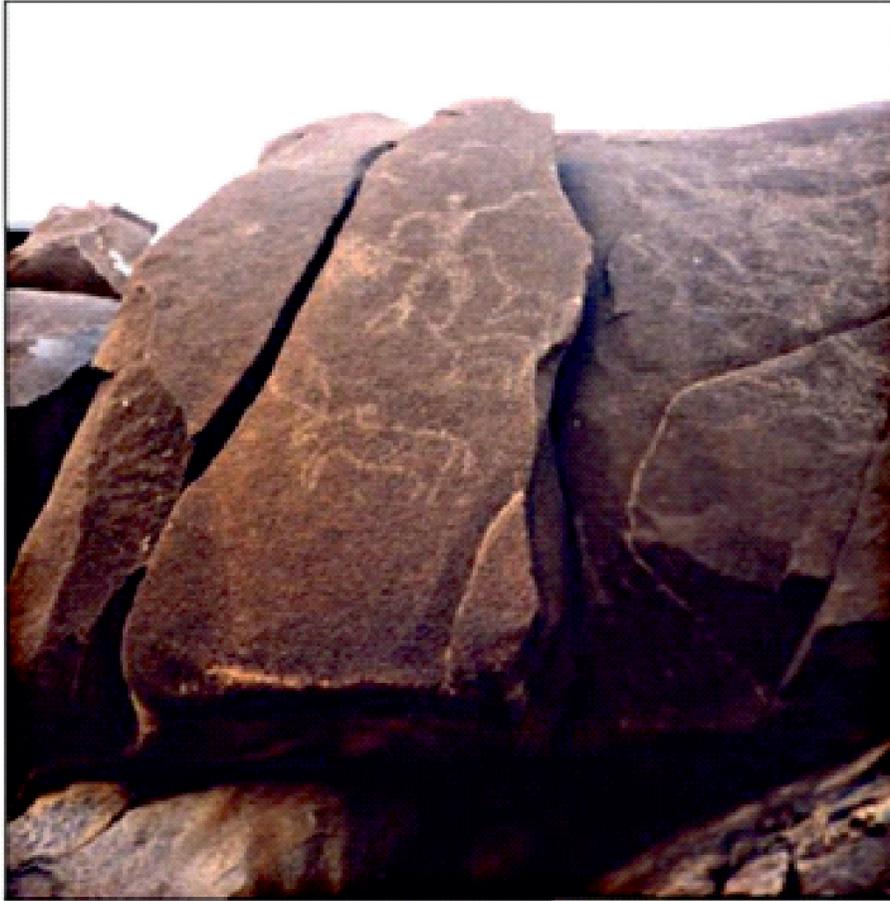


Fig. 11: The bovine and the Master, from Peacock Hill (West side), Kuggallu (Courtesy- Boivin 2003: 45).

Interestingly, Zebu cattle in Malaprabha basin and Bhima River Valley have this same haemoglobin type. If wilder bovine species, facing extinction, were recruited for induction of favorable genetic and phenotypic traits in domesticated cattle, given the mass migration and robust morphological character of Bison, it would have been most suitable for the occasion. One faint evidence, not to be ignored, which also proves Indian domestication of Zebu in South India, comes from Rock-art analyzed herein. The site of Kuggallu possibly exhibits this very scenario on its much renowned Peacock Hill, where one may still witness petroglyph of a man riding/commanding a Zebu, which resembles its wilder bovine ancestor (Indian Bison) to a considerable extent.

Conclusion- *The Way Ahead*

Our informants from the Stone Age are few, restricted, segmented and limited in their historical ability to present a proper view and strides of narrative afore us. Only the use of analytical techniques can enlighten the way forward, and help us in extracting maximum possible information from available sources. While mineral-analysis, stylistic patterns and chronological orders play a major role, they cannot give us a deeper insight into the motives and methods of prehistoric artists, and their artwork. A further advancement in this direction would be the analysis of elements that, in totality, constitute the Rock-art. This would unveil a new feature of rock-paintings, i.e. their evidential utilization for affirming and assessing fauna of Prehistoric India. Our analysis in this paper presents a parallel picture that not only substantiates, but opens a unique dimension, and gives us a vantage point.

Bisons are one of the largest of bovines, with a history intertwined with that of many species of cattle of India (Van Vuure 2005: 26). A study singularly focused on Bisons and their Rock-art appearance holds significance from multiple viewpoints. After the extinction of Aurochs, wild variety of Bisons became patently one of the most widespread Bovid ancestors of domesticated varieties (Fuller 2008). Besides, the encounter of humans with Bisons was the initial step towards the commencement of a long tryst with livestock raising and dairy economy (Mithen 2012: 56). After elephants, Bisons are the most distinctive of faunal creatures present in rock-paintings. Additionally, the presence of Bisons reveals a distinguished spectrum of bovine-hominid interaction, ranging from hunting and ritual association at Bhimbetka to socio-economic utilization at Chaturbhujnath Nala. A complete ritualization of Bison is glimpsed in Hazaribagh (periodic reverence, secretive sketches etc.), while pronounced domestication and assimilation of the creature is witnessed at Huligemma Kolla. The intentionality of paleo-artist became somewhat (though, not definitely) by the application of contextually relevant Neuro-aesthetic principles (Heyd 2017: 426). A careful perusal of these sites and paintings helps us to connect them with impactful genomic events that shaped evolutionary bio-cultural conditions of Indian cattle.



Fig. 12: An interlinked GIS map featuring all four major sites discussed in the paper (Courtesy- the author).

For more information and legends with co-ordinates, visit the web-link-https://www.google.com/maps/d/u/0/edit?mid=1nuk7Aeife9y9JD_0h73Nd5Xcv-lpBB8&ll=19.007197222454515%2C80.17389150000002&z=5

This study further helps us in countering certain hypotheses (or, rather parts of them) with sound evidential material offered by rock-paintings, examples of which we have seen herein in cases of genesis of Mithun in North-east, dispersion of bison to South East Asia, and in ascertaining the chronology and conditional context within which secondary domestication of Zebu Bull in South India took place. The trail of Bisons has helped us in understanding not only the pattern of emergence of Bovine bio-cultural realm in Indian Prehistory, but also in comprehending our advancement as a species in conscious consonance with fauna of the times. Future discoveries of newer Rock-art centres and materials in India, especially in North-east, and extension of the range and diversity of genetic analysis would bring even more rich data for our due consideration.

Notes

1. Genetic analysis reveals three distinct Auroch species- *Bos primigenius primigenius* in Fertile Crescent and *Bos primigenius namadicus* (Helmer et.al. 2005), and both took separate and distinguished evolutionary pathways- former, on domestication (probably by Natufians in c. 10,000 BCE) became 'taurine cattle', while the latter transformed into Zebu Bull (*Bos indicus*) as a result of taming by hominids in Upper Indus Valley especially during the Early Neolithic Period (c. 10,500 BCE). Between the two, the one in Fertile Crescent possibly occurred slightly earlier, and from here Taurine species spread to European region via the 'northern' Danubian route and 'southern' Mediterranean route. This domesticated cattle probably moved along with the migrating West Asian farming-communities, when this social-group passed from the Balkans and Greece in c. 9000 BCE.
2. The Mesolithic cultural complex is glimpsed from the discovery of micro-lithic tools, scrapers, borers, crescentic blades, retouched and parallel blades, transversely flaked graters etc. (Pandey 2012: 57; Hasnain 1992: 71). The increasing interest in ritual activities is further configured from elaborate burial activities, where a single space (the auditorium) was selected and repeatedly utilized for such works, along with the application of ochreous material to inlaid bodies (Gupta 1972: 36). Chakrabarty (1999: 169), out of which our example closely fits Phase D (stylized depiction of living beings, humans dominating landscape, dotted lines/coloured patches etc.) of development of Mesolithic context art at Bhimbetka. The Mesolithic people at Bhimbetka were chiefly hunter-gatherers, who hunted in groups to optimize chances of capturing meal of the day. However, this region of Madhya Pradesh was not rich in agricultural produce (only realized in Early Historic Period at this site). Thence, hunting dominated as the vital strategy to acquire food and resources. This ecological niche (predators- humans/animals and preys) considerably effected the dynamics of bovine speciation. It also impacted ways in which wild bovines, such as Bisons, then predominant in this region, were treated by then contemporary human populace. The example at Bhimbetka could be considered as the commencement of a long process of much wilderness and wonderment.
3. In words of Zeder (2012: 213)- "Most major livestock species, however, entered into domestication through what might be called a prey pathway. Rather than initiating the relationship, these animals were primary prey species that humans had hunted for their meat and hides for thousands of years. The prey pathway likely began when, perhaps as a response to depletion of local stocks of these prey animals, humans developed hunting strategies designed to increase prey availability. Over time and under certain circumstances, these game management strategies developed into actual herd management and, eventually, the controlled breeding of managed animals."
4. We may forward another line of argument to place Fig.08 in Mesolithic- on the spectrum of bovine-hominid interaction, this painting has a pronounced inclination towards former, even when this site neighbors Bhimbetka, and saw continuous residence upto Early Historic period.

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