NEOLITHIC CULTURE IN HAGARI-UPPER PENNAR REGION: AN ARCHAEOLOGICAL INVESTIGATION

A **thesis** submitted during **2017** to the University of Hyderabad in partial fulfilment of the award of **Ph.D. degree** in **History**

by

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I, **Opangtula Imsong,** hereby declare that this thesis entitled "**Neolithic Culture in Hagari-Upper Pennar Region: An Archaeological Investigation"** submitted by me under the guidance and supervision of **Prof. K.P. Rao** is a bona fide research work, which is also free from plagiarism. I also declare that, it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodganga/INFLIBNET.

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CHAPTER 1

INTRODUCTION

The term Neolithic is derived from the Greek word "*neolithikos*", *neos*, "new" and *lithos*, "stone" meaning "New Stone Age." Sir John Lubbock in his book "*Prehistoric Times*" coined the term in 1865 to divide the Stone Age further into Palaeolithic and Neolithic.[1]

The Neolithic period beginning about 8000-7000 BC in the Middle East,[2] considered the last part of the Stone Age had ushered a new era in human history. The end of the Pleistocene and the transition to Holocene, brought a new stage of settled villages with cultivation of plants and domestication of animals. This development marked a shift in the human adaptive behaviour, by means of harnessing the environment or the natural world. The "ability to produce food from domesticated plants and animals opened up a new pathways to beginning of agriculture,"[3] and transition from hunting and gathering to agriculture based life. The gradual steps by which man took control over the supply of food; by selecting the species to cultivate and to taming of animals has been described by V. Gordon Childe, as the Neolithic Revolution. Childe used "the term, 'revolution' to describe the origin of food production"[4] and the significant transformations that affected the human ways of life of the Neolithic communities. The Neolithic Revolution was the

[1] Susan Foster McCarter, *Neolithic* (New York: Routledge, 2007), 2.

[2] Barbara Ann Kipfer, *Dictionary of artefacts* (USA: Blackwell, 2007), 213.

[3] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers*? (New York: Oxford University Press, 2006), 1.

[4] V. Gordon Childe, *Man Makes Himself* (London: Watts & Co., 1936), 74-75.

first revolution that resulted in the transition from hunting and gathering to agriculture and settled life.[5] It took place at different times in different regions of the world. The term denote to a general period in which the developments took place and brought changes to Neolithic societies, with adoption of cultivation and domestication of animals. The significance of Neolithic revolution also brought great changes between the human-land relationships. With, the ability to control the environment, it led people to begin semi-sedentary and subsequently to permanent settlement. It also increases the demand of food supply, and this led to the first steps towards selection of plants to cultivate and domestication of certain animals. The ability to sustain large populations for subsistence, where crop was grown by man with an increased reliance on vegetable and cereal foods, resulted in the development of social complexities or relations, where by it lead to the creation of hierarchy in society and development of "non-food producer class, that use the surplus food production and necessitate the development of urban civilization."[6] The transition from hunting-gathering, to sedentary, creation of new social life with domestication of plants and animals has provoked many scholars to put forward different theories on this development.

There are different theories on How Neolithic transition could have happened?

- Oasis theory: The climate got warmer and drier at the end of the Pleistocene. This fluctuation forced the humans and animals to move and settle in the fertile areas of oases, where water was available. In order to survive in the new environment, they changed their way of life, developed a close

[5] Michael Smith, "V. Gordon Chide and the urban revolution: A historical perspective on a revolution in urban studies," *Town Planning Review*, vol. 80 (2009):6. http://dx.doi.org/10.3828/tpr.80.1.2a

[6] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers*?, 2.

relationships with certain plants and animals which eventually resulted in domestication. This theory was proposed by V. Gordon Childe in 1928.[7]

- Nuclear Zone or Natural Habitat theory: Braidwood[8] coined the term "Nuclear Zone" or Natural Habitat Zone" hypothesis in response to Childe's oasis theory. The theory suggests that domestication began in natural habitats called the "hilly flanks of the Fertile Crescent"[9], the Zagros and Taurus mountains as a natural environment zone of wild plants and animals potential for domestication. The theory emphasises that domestication began as a result of human adaptation to their environment and experimentation on the potential wild plants and animals. However, the theory did not explain the cause, why the domestication occurred?
- Population Pressure theories: Based on the ideas of Boserup,[10] who proposes population growth as the determining factor for the development of agriculture, scholars like Binford, Flannery and Cohen,[11] formulated a theory focusing on 'Marginal Zone' and argued that with increased population in the favourable areas, some groups were forced to migrate into the areas of low potential food resources i.e., marginal zones. According to this theory, the population explosion in these areas created imbalance in the natural resources and ultimately led to adoption of agriculture to survive.

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[7] Susan Foster, McCarter, *Neolithic,* 166.

[8] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers*?, 18.

[9] Gary A. Wright, "Origins of Food Production in Southwestern Asia: A Survey of Ideas," *Current Anthropology* 12, no.4-5 (1971): 118, https://www.jstor.org/stable/pdf/2740931.pdf; Susan Foster, McCarter, *Neolithic,* 168.

[10] Quamrul Ashraf and Stelios Michalopoulos, "The Climatic Origins of the Neolithic Revolution: Theory and Evidence," in *Researchgate* (2010):4, https://www.researchgate.net/publication/228736303.

[11] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers*?,32; Gary A. Wright, "Origins of Food Production in Southwestern Asia: A Survey of Ideas,"122.

- Social Prestige theory: The theory emphasised that sedentism leads to changes in "social structures and increased social inequality"[12] among the hunter-gatherers. According to Barbara Bender[13] and Hayden,[14] as social systems develop, there emerged a rivalry and competition among the communities, wishing to achieve status and prestige by controlling the food surplus and throwing feast to show dominance.[15] In other words, to maintain the prestige and social competition, it eventually encouraged to produce large surplus of food which leads to development of agriculture and domestication.
- Evolutionary theory: The theory proposes agriculture as an outcome of evolutionary interaction between humans and plants. According to David Rindos,[16] the evolution followed three stages;

  Incidental domestication – humans started to select wild plants to cultivate and protect them.

  Specialized domestication – selection of location in which plants and humans got adapted to each other.

  Agriculture domestication – humans began to take control of the plants and selection of seeds to domesticate.
- Younger Dryas – This theory suggests climatic changes of the 'younger dryas'[17] i.e., dry and cold environment conditions where the wild plants were

[12] Ibid., 36.

[13] Ibid.

[14] Susan Foster, McCarter, *Neolithic*, 170.

[15] Purushottam Singh, *The Neolithic Origins* (New Delhi: Agam Kala Prakashan, 1991), 12.

[16] Ibid.

[17] Ofer Bar-Yosef, "Climatic Fluctuations and Early Farming in West and East Asia," *Current Anthropology* 52, no. 4 (2011):175-193, http://www.jstor.org/stable/10.1086/659784; Jacob L. Weisdorf, "From Foraging to Farming: Explaining the Neolithic Revolution," *Journal of Economic*

reduced in the inhabited ecology of the sedentary or semi-sedentary communities and forced them to cultivate the wild cereals for survival.

Through the above discussed major theories on origins of agriculture, it can be accepted that no single proposed explanations give an entirely satisfactory answer to the key issues on emergence of agriculture. Multiple factors for example "sedentism and introduction of tools preceded agriculture, agriculture took place in complex, affluent societies where food resources were available, and appearance of hierarchical structures in foraging societies"[18] suggests involvement of different factors in different parts of the world, though still there is no universal applicable explanation to emergence of agriculture.

Indeed, at present many scholars widely believe that agriculture did not emerge overnight but many times independently in different regions of the world, with varied features and results. Thus, it can be rightly acknowledge that;

"The Neolithic is not a specific chronological period, but rather a suite of behavioural and cultural characteristics, including the use of wild and domesticate plants and the use of domesticated animals."[19]

The use of the term 'Neolithic' is complex, the word first applied as a technological term is now oriented towards subsistence. Later, the importance was seen emphasised to domestication of plants and animals. The widely accepted term is

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Surveys 19, no. 4 (2005):568, http://classes.uleth.ca/200701/anth1000b/foraging%20to%20farming.pdf.

[18] Ibid., 582.

[19] Michael A Cahill, *Paradise Rediscovered, The Roots of Civilization*: Vol. 2 (Australia: Glass House Books, 2012), 103, https://books.google.co.in/books?id=nHf969HMv48C&printsec=frontcover&source.

"the Neolithic ways of life that encompasses, technology, economic, social and ideological aspects as a whole."[20] The "Neolithic communities were skilled farmers, manufacturing wide range of tools necessary for tending, harvesting and processing of crops (such as sickle blades and grinding stone) and food production (e.g. pottery, bone implements)."[21] The polished stone axes and adzes, characteristics of Neolithic period demonstrates the prehistoric technological abilities and transition from foraging to food production. The studies on Natufian ground stone tool analyses provide evidences associated with development of agriculture as well as subsistence strategy. Several studies, "often support the assumption of plant exploitation during the Natufian period."[22] The direct evidence to initial development of agriculture, could be the use of polished stone axes for clearing the forest on large scale. This together with adze, for dressing wood for shelter probably enabled them to exploit the natural resources and occupy the land for cultivation purposes.

The beginning of Neolithic culture is considered to be in the Levant, Jericho dated to about 9000 BC.[23] The studies on the region, believed that it developed from the Natufian culture, beginning about 13,000-9500 BC[24] and is considered the threshold of the incipient cultivators and domesticators. The evidence of wild cereals, sickle blades and crude house structures suggests that "Natufians were secondary

[20] Ciler Cilingiroglu, "The concept of "Neolithic Package": considering its meaning and applicability," *Documenta Praehistorica* XXXII (2005):1, https://www.academia.edu/964591/2005.pdf.

[21] Michael A Cahill*, Paradise Rediscovered, The Roots of Civilization:* Vol. 2, 106.

[22] Laure Dubreuil, et al., "Current analytical Framework for Studies of Use-wear on Ground Stone Tools," *in Use-Wear and residue Analysis in Archaeology,* ed. Joao Marreiros et al. (New York: Springer, 2015), 106.

[23] Purushottam Singh, *The Neolithic Origins*, 20.

[24] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers*?, 116.

foragers and the earliest farming communities."[25] As the Natufians had become dependent on wild cereals, plants and were semi-sedentary, the climatic crisis of the Younger Dryas associated with cold and dry conditions reduced the growth of wild cereals,[26] and this perhaps forced the people to develop intensive management of plants to cultivate. By 8500-6500 BC,[27] a mixed cultivation arose in "Levant and spread to Asia Minor, North Africa and North Mesopotamia."[28] The early Neolithic practised mixed farming which included both wild and domesticated plants and also herding of sheep and goats. The domesticated cattle, pigs and the use of pottery by 8000 BC, marked the development of full-fledged agriculture, increased sedentary life and the emergence of social inequalities among the farming communities.[29]

It should be noted that not all these elements of the Neolithic appeared in the same order at the same time. Some of the elements appeared later or were distinctly absent. For example, the earliest farming communities of South-West Asia did not use pottery, though "baked clay was practised for making bricks and figurines,"[30] and in parts of Europe, cattle domestication preceded agriculture, the farming communities were semi-sedentary. In the case of Africa, "pastoralism existed with absence of plant cultivation and agriculture."[31] While there is evidence in other parts of the world, such as South Asia and Southeast Asia of regional distinctive features, where indigenous

[25] O. Bar-Yosef et al, "The Natufian Culture and the origin of the Neolithic in Levant," *Current Anthropology* 31, no.4 (1990):433, https://www.jstor.org/stable/pdf/2743274.pdf.

[26] Ibid.

[27] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers?,* 137.

[28] Neolithic, https://en.wikipedia.org/wiki/Neolithic, accessed on: 8/7/2017.

[29] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers?,* 145.

[30] Ibid., 131.

[31] Dorian Q. Fuller, "Agricultural Origins and Frontiers in South Asia: A working Synthesis," *Journal of World Prehistory,* vol. 20 (2006):59, https://link.springer.com/article/10.1007/s10963-006-9006-8.pdf.

domestication arose independently of South-West Asia. For example, Jomon farming societies in Japan used pottery prior to domesticated crops, in India, "South India and in Gangetic, cultivation was evident among the non-sedentary societies and in Mehrgarh, the earliest agriculture, i.e., prior to 6000 BC, precedes without pottery."[32] While in East Asia, the "Peiligang and Pengtoushan, each thought to span around 7000 BC,"[33] are the sites with earliest evidence of Neolithic culture. These communities practised rice and millet cultivation and possibly cattle herding.

In South Asia, the Neolithic settlement is represented by Mehrgarh on the Kachi plain of Baluchistan, and is one of the earliest evidence for domestication of both plants and animals. The domesticated animals (sheep and goats) and crops (wheat, barley and cotton, sesame in later period), clearly points the farming subsistence as developed from South West Asia. The findings at aceramic Neolithic occupation suggests the settlement began at Mehrgarh from 8500-7000 BC.[34] The agriculture origins or cultivation of crops in India, at present is evident from four sites north of the Ganges and in the northern Vindhyas. The Senuwar and Mahagara suggest native species or rice-millet cultivation in the early Second Millennium BC, though much is awaited to resolve dating. The recent findings from Jhusi[35] and Lahuradewa,

[32] Ibid., 59-60.

[33] Graeme Barker, *The Agricultural Revolution in Prehistory: Why did Foragers become Farmers*?,192.

[34] Ibid., 28.

[35] Anil K. Pokharia et al., "Plant macro-remains from Neolithic Jhusi in Ganga Plain: evidence for grain-based agriculture," *Current Science* 97, no. 4 (2009):566.

C14 dating indicates the Neolithic communities association with rice and full establishment of rice cultivation by seventh millennium BC.[36]

The development of Neolithic in India is marked by complexities with distinctive regional characteristics. Largely influenced by the physiographical features, the differences in soils and geology, natural vegetation and monsoon distribution have caused different Neolithic progenitors to favour different regions. This has in turn shaped the distribution and spread of the Neolithic culture in the Indian sub-continent. Further, there is no clear distinction of the cultural development of Neolithic and into Chalcolithic. Because of this overlapping, the term Neolithic - Chalcolithic is sometimes used jointly to explain the Indian situation. An attempt on distribution of Neolithic pattern in Indian continent can been seen through the works of several scholars like, Worman,[37] V. D. Krishnaswami,[38] Sundara,[39] Sankalia[40] who tried to explain the distribution by various regional divisions. B.K Thapar,[41] has established the Neolithic culture of India into six regions (i) the region covering Baluchistan, Swat and Upper Sin valley in Pakistan, (ii) northern region covering the Kashmir valley, (iii) eastern region covering Assam, Chittagong and sub-Himalayan regions including Darjeeling, (iv) the Chota Nagpur plateau covering parts of Orissa, Bihar and West

[36] Rakesh Tiwari, et al., "Early Farming at Lahuradewa," (paper presented in the International Seminar on the 'First Farmers on Global Perspectives,' Lucknow, India, 18-20 January, 2006). http://archaeology.up.nic.in/doc/efl_rtrk.pdf.

[37] Purushottam Singh, *The Neolithic Origins*, 128.

[38] V. D. Krishnaswami, "The Neolithic pattern of India," *Ancient India*, no. 16 (1960): 26.

[39] A. Sundara, "Cultural Ecology of the Neolithic in India," in *Recent Advances of Indian Archaeology*, eds. S. B. Deo and K.Paddayya (Pune: Deccan College Post Graduate and Research Institute, 1985), 39.

[40] H.D. Sankalia, *The Prehistory and Protohistory of India and Pakistan* (Pune: Deccan College, 1962), 280.

[41] B.K. Thapar, "Fresh light on the Neolithic Cultures of India," in *Archaeological Perspective of India Since Independence,* ed. K. N. Dikshit (New Delhi: Books and Books, 1985), 37.

Bengal, (v) mid-eastern covering parts of Bihar and Uttar Pradesh and (vi) south, comprising the whole of Peninsular India. While, based on the ecological and the presence of wild domesticated crops "the Allchins, divided the regions into; (i) the Indus system and its western borderland, (ii) the Ganga Valley, (iii) western India and north Deccan and (iv) Southern Deccan,"[42] respectively. As stated earlier of the diversities both these scholars also pointed out the southern Neolithic as having its own distinct characteristics.

In the context of southern Neolithic, Allchin and Allchin[43] distinguished three phases in the development of this culture spread over the areas of Andhra Pradesh, Karnataka and northern Tamil Nadu, which displays uniform tradition and represent the southern Neolithic. The phases are: Phase 1 (2500-2000 BC); Phase II (2000-1600 BC) and; Phase III (1600-1000 BC). The last phase witnessed an intrusion of copper and bronze tools, evidence of new ceramics like grey and buff wares and the wheel made pottery. Chronologically, the Southern Neolithic is broadly placed between 2800-1000 BC.[44] Which is now being modified with radiocarbon dates from Watgal dated to 2900-2800 BC, close to Kodekal earliest layer calibration.[45] A new suite of AMS C-14, provides a new date between 3000-1200 BC for the southern Neolithic.[46] The revised chronological framework for southern Neolithic is divided into; Neolithic

[42] Allchin and Allchin, *The Rise of Civilization in India and Pakistan* (New Delhi: Select Book, 1983), 97.

[43] I. Kartikeya Sarma, "Neolithic-Chalcolithic Cultures in Andhra Pradesh" in *Pre and Protohistoric Andhra Pradesh up to 500 BC,* ed. M.L.K. Murty (Chennai: Orient Longman, 2003),89.

[44] Allchin & Allchin, *The Rise of Civilization in India and Pakistan*, 286.

[45] Ravi Korisettar et al., "Archaeological Re-investigation and Archaeozoology of Seven Southern Neolithic Sites in Karnataka and Andhra Pradesh," *Man and Environment* 26, no.2 (2001):48.

[46] Dorian Q.Fuller et al., "Dating the Neolithic of South India: A New Radiometric Evidence for key Economic, Social and Ritual Transformations," *Antiquity* 18 (2009):756.

I (3000-2500 BC); Neolithic II (2200-2000 BC); Neolithic III (1800-1200 BC).[47] Each of these divisions is provided with archaeological evidence characterized by distinctive features of its own. Accordingly, 3000-2500 BC of Neolithic IA saw the earliest settlements without evidence of ashmounds represented by Watgal, Kodekal and Utnur sites distributed in Shorapur and Raichur doab. These sites yielded ceramic evidence but no clear evidence of archaeobotanical or faunal remains. This phase corresponds to the IA phase of the Allchins.[48] The Neolithic IB dated to 2500 BC corresponding to phase IB of the Allchins, is characterized by the first ashmounds at Utnur, Budihal, Palavoy, Brahmagiri A, Kudatini and also the hilltop ashmounds at Kurugodu and Choudammagudda sites found in Shorapur, Raichur, Bellry, Chitradurga and Anantapur regions.

The Neolithic II A dated to 2200 BC, saw hilltop ashmounds and villages at Budihal, Banahalli and T. Narsipur. This phase witnessed the growth of Neolithic culture beyond the ashmound zone of Karnataka and Northeast Tamil Nadu.[49] The phase Neolithic II B dated to 2000 BC which corresponds to Phase IIB of Allchins, are the hilltops ashmounds with expansion of villages in the Upper Tungabhadra River at Sannarachamma, Hiregudda, Hallur and Payaimpalli with evidence of native cultivation crops and also wheat and barley; faunal remains etc. By Phase III, dated to 1800 BC., most ashmounds ceased except for the Neolithic settlement continuity at

[47] The new AMS dates provides a chronological model for better understanding of the Southern Neolithic and ashmound distributions variation among the regions. This framework also offers a detailed evidence of the archaeological finds in each division of the phases.

[48] Dorian Q.Fuller et al., "Dating the Neolithic of South India: A New Radiometric Evidence for key Economic, Social and Ritual Transformations," 762-763.

[49] Ibid., 764-765.

Sannarachamma and Hiregudda.[50] There appears Neolithic settlement expanded eastwards to the Kunderu river basin and south of Pennar River in Cuddapah district. This phase reports the evidence of African crop origin dated to 1500 BC and probably the beginning of aboriculture, fibre crops and intrusion of copper and gold objects.[51]

The extensive fieldwork and studies carried out by various scholars over the years has expanded the geographical spread of the southern Neolithic. Due to geographical and chronological extent apparent variations appeared among the regions in the artefactual assemblages and presence of ashmound sites. Taking these aspects into consideration, "Paddaya proposed nine regional variants, called the 'South Indian Neolithic culture' with Bellary, Raichur and Shorapur doab as the nuclear zone for evolution of Neolithic culture."[52] The Variant 6 - 9, a new revised scheme of the earlier regional variants is identified as coastal (Variant 6) in Guntur and Prakasam district, Variant 7 is identified in the Telangana region of mid-rivers Godavari and Krishna, Variant 8 - 9 located in northern Tamil Nadu and Coastal Karnataka. According to the author, the four revised regional variants features the absence of ash-mounds and indicates an importance to crop cultivation and animal domestication.[53] Paddayya writes, "The South Indian Neolithic culture is one of the best known and most extensive early agro pastoral complexes of the continent."[54] The distinctive

[50] Ibid., 766-767.

[51] Ibid., 773.

[52] K. Paddayya*, Investigation into the Neolithic culture of the Shorapur Doab, South India*, (Leiden: E.J.Brill, 1973), 87.

[53] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis,* 73-74.

[54] K. Paddayya, "Some Observations about the Transition from Hunting-Foraging to Farming in India," *Puratattva*, no.45 (2015):103; Dorian Q. Fuller, in "Agricultural Origins and Frontiers in South Asia: A working Synthesis," also expressed the same view of the rich archaeobotanical remains and practice of

feature of the South Indian Neolithic is the indigenous evolution of the culture - that includes the creation of ash-mound, native crop cultivation system, introduction of domestic animals (sheep and goats),[55] along with the wild species and the overwhelming importance of cattle in the region. The tradition of ash-mounds a unique characteristics of Southern Neolithic, which makes it stand out among the other Neolithic complexes of the Indian continent, have been a subject of debate over the centuries. The ash-mounds first noticed in the early nineteenth century by Col. Colin Mackenzie,[56] followed by Col. Meadows Taylor,[57] New Bold,[58] Bruce Foote and F.R. Allchin[59] and several others have propounded various theories on the origin of these mounds. The initial theory were associated to cremation grounds of *rakshasas* or demons of Hindu mythology. The ash deposits have been thought to result from industrial wastes such as iron smelting, pottery making and glass manufacturing activities. Princep and Benza,[60] proposed that the ash deposits are formed by natural volcanic ash and deposits of Kankar and limestone slags. While there are views often been linked as places for *sati* immolations by women during the Vijayanagar period.[61]

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pastoralism in the southern complexes as the evidence to study the agro pastoral systems in south India.

[55] They are the progenitors of Northwestern South Asia and this suggests possibly internal influences on the development of Neolithic in South India.

[56] Ravi Korisettar et al., "Brahmagiri and Beyond: The Archaeology of the Southern Neolithic," in *Indian Archaeology in Retrospect,* vol.1*, Prehistory Archaeology of South Asia,* eds., S. Settar and Ravi Korisettar (New Delhi: Manohar, 2002), 153.

[57] Ibid.

[58] T. J. Newbold, "On some Ancient Mounds of Scorious Ashes in Southern India," *Journal of the Royal Asiatic Society of Great Britain and Ireland*, no.7 (1843): 129.

[59] F. R. Allchin, Utnur Excavations (Hyderabad: The Government of Andhra Pradesh, 1961), 7.

[60] K. Paddayya, "Doing Field Archaeology with Reference to Ashmounds of Southern Deccan," *Puratattava,* no. 43 (2013):31.

[61] K. Paddayya, "The Problem of Ashmounds of Southern Deccan in the light of Budihal Excavations, Karnataka," *Bulletin of the Deccan College*, vol. 60-61 (2001): 190.

However, the numerous analysis over the years, refute all these theories and have proved that these mounds are the results of the burning of cow dung by the Neolithic communities. Allchin, has also pointed out the same view of burning of cow dung in the formation of the ash-mounds. He ruled out the importance of "ash fire-cult" during the Neolithic period and this was supplemented through a detailed study of place names with word *Budi* meaning ash and its importance of cattle in the folk religious tradition.[62] Further, systematic excavations at Kupgal, Budihal, Hullikallu and fresh work at Sanganakallu confirmed the ash deposits origin to Neolithic period, rather than to Iron Age origin[63] as postulated by scholars such as Rami Reddy and Sundara on account of their findings at Palavoy and Venkatapur ash-mounds.[64]

The importance of cattle, in Neolithic of south India is seen in the context of the numerous existing ash-mounds with evidence of cattle pens, cow dung deposits and animal bone remains from the excavated sites. The butchering animal spaces at Budihal,[65] hoof prints at Utnur,[66] and bone remains indicate the dominance of cattle economy and practise of pastoralism among the Neolithic communities of South India. Yet, another prominent evidence is from the rock art images of southern Neolithic sites, where the overwhelming depiction of cattle is the humped bull. Though the origin and breed of the cattle, found in the southern Neolithic is unclear. Two common 'breeds' of cattle have been identified- (a) long horned (acutiforns or longifrons), slender bodied and humped (the zebu) and (b) massive and short horned with low

[62] F.R. Allchin, *Neolithic Cattle Keepers of South India: A Study of the Deccan Ash Mounds* (New York: Cambridge University Press, 1963), 142.

[63] K. Paddayya, "Doing Field Archaeology with Reference to Ashmounds of Southern Deccan," 46.

[64] Ibid.

[65] K. Paddayya, "The Problem of Ashmounds of Southern Deccan in the light of Budihal Excavations, Karnataka," 210.

[66] F.R. Allchin, *Utnur Excavations* (Hyderabad: The Government of Andhra Pradesh, 1961), 12.

hump.[67] The rock bruising of humped bull at Velpumadugu, in Anantapur district have been identified as the acutiforns type. According to Allchin's, "the acutiforns represents an indigenous breed"[68] possibly domesticated from local wild populations of the zebu varieties a typical of modern cattle in southern India. Though, not clear the archaeozoological samples suggests that the "zebu cattle were domesticated in the Indus region to the northwest and it is probable that it could have spread to peninsular India between 3500 and 2500 BC."[69] The depiction of *Bos indicus* in the rock paintings of Budagavi, can be taken as an indication of the introduction of domesticated cattle along with the wild by the Neolithic of the region. All the above lines points to the centrality of cattle in the social life of the Neolithic communities and the symbolic meaning and rituals associated with the ashmounds.[70]

The role of crop cultivation from southern Neolithic has been obscure due to lack of archaeobotanical evidence. However, the recent archaeobotanical studies from the Neolithic sites provide "an understanding of the system of crop cultivation and subsistence of the southern Neolithic."[71] The results indicated the evidence of "basic

[67] N. Chandramouli, "Beginning of cattle domestication in Andhra region: Perspectives of Rock Art and Archaeology," *Purakala,* vol. 22 (2012):51.

[68] F.R. Allchin, *Piklihal Excavations* (The Government of Andhra Pradesh: Hyderabad, 1960), 118.

[69] Charlene A. Murphy and Dorian Q. Fuller, "The Transition to Agricultural Production in India: South Asian Entanglements of Domestication," in *A Companion to South Asia in the Past*, ed. Gwen Robbins Schug et al., (UK: John Wiley & Sons, Inc., 2016), 349.

[70] Ibid., 353.

[71] Dorian Q Fuller et al, "Southern Neolithic Cultivation Systems: A reconstruction based on Archaeobotanical Evidence," *Journal of the Society for South Asian studies*, vol. 17 (2001):171; Dorian Q.Fuller et al., "Dating the Neolithic of South India: A New Radiometric Evidence for key Economic, Social and Ritual Transformations," 772.

Neolithic package"[72] of millets and pulses that were cultivated throughout the region. The two species of millets, browntop millet (*Brachiaria ramosa*) and bristley foxtail millet (*Setaria verticillata*) are still cultivated locally in some areas. The two dominant pulses, horsegram (*Macrotyloma uniflorum*) and mung bean (*Vigna radiata*) occurs from the "earliest levels of southern Neolithic sites, such as at lower level of Sanganakallu."[73] These crops did not occur in the Neolithic of "north-western part nor found at Gangetic sites of the subcontinent,"[74] indicating that these are native species of the southern region and the cultivation based on indigenous species rather than introductions from outside.[75] While the appearance of other non-native species in the later phase of Neolithic such as wheat and barley, hyacinth bean, pigeon pea, African pearl millet and rice (Hallur) on few sites did not dominate the native species, suggesting later introductions from elsewhere.[76] In addition to seed crops, fruits like jujube, figs, Jambolan, wild squash and tubers possibly yam, were evident from the charred archeobotanical samples at several. Thus, the above several lines of distinctive elements in particular indicates local emergence, although it is no doubt that there were certain traits of external elements involved in the process.

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[72] Charlene A. Murphy and Dorian Q. Fuller, "The Transition to Agricultural Production in India: South Asian Entanglements of Domestication," 347.

[73] Dorian Q. Fuller, Dung Mounds and Domesticators: Early Cultivation and Pastoralism in Karntaka," in *South Asian Archeology, Volume 1 Prehistory*, eds. Catherine Jarrige et al., (Paris: Recherche sur les Civilizations, 2001), 118; Patrick Roberts et al., "Local diversity in settlement demography and subsistence across the southern Indian Neolithic-Iron Age transition: Site growth and abandonment at Sangnkallu-Kupgal," *Archaeological Anthropological Science* 8 (2015):585.

[74] Charlene A. Murphy and Dorian Q. Fuller, "The Transition to Agricultural Production in India: South Asian Entanglements of Domestication," 347.

[75] Dorian Q. Fuller, "Agricultural Origins and Frontiers in South Asia: A working Synthesis," 50.

[76] Dorian Q Fuller et al, "Southern Neolithic Cultivation Systems: A reconstruction based on Archaeobotanical Evidence," *Journal of the Society for South Asian studies*, vol. 17 (2001):174.

Previous Research in South India and in the Study Area

The Neolithic research in South India begins with the finds of stone implements and discovery of ash-mound sites. The first report on ash-mounds by Mackenzie in the early nineteenth century[77] and the periodic appearance on brief notes, inspired the other researchers to document the archaeological wealth of the region. Works carried out by individuals and scholars like William Fraser who discovered the Kupgal Neolithic habitation, and notable work by Bruce Foote, in Karnataka, Northeast Tamil Nadu and South-Western Andhra Pradesh, brought nearly 252 Neolithic sites with large collection of antiquities, which includes the first ever discovery of Palaeolithic tool in the region. However, systematic report was brought to light only by the excavation at Kupgal by New Bold, in 1936. Among all the discoverers, the contribution of Bruce Foote to Indian prehistory is outstanding. The catalogue titled *Prehistoric and Protohistoric Antiquities of India*, published in 1916, is a valuable contribution of the artefacts recovered from the sites and an aid to understanding the lithic technology of southern Neolithic. The author was the first to point out the association of ash-mound with Neolithic settlements and suggest that they were burnt cow dung considering the practise of cattle pastoralism in rural areas. He also point to the location of settlements in relationship with landscape and the role of geographical influence on distribution of sites. The early twentieth century witnessed contributions from Munn (1934), Yazdani (1935) and Ahmad (1935, 1937), adding Neolithic sites through excavations in the Raichur Doab. In fact, acknowledging the genesis contributions, it was not until 1947 that conscious attempt was made to study the chronological cultural context of the South Indian Neolithic.

[77] Ravi Korisettar et al., "Brahmagiri and Beyond: The Archaeology of the Southern Neolithic," 153.

After 1947, Wheeler's report on Brahmagiri excavation, witnessed a good number of researches contributing to systematic excavations of Neolithic sites in different parts of South India. Among them, the notable excavated sites are, Maski (Thapar, 1957), Nagarjunakonda (Soundara Rajan,1958), Piklihal (Allchin, 1960), Utnur (Allchin, 1961), Kesarapalli (IAR 1961-62, Tekkalakota (Nagaraja Rao and Malhotra,1965), Kupgal (Mujumdar and Rajaguru 1966), Piyampalli (IAR 1964-65, 1967-68) Singanapalle (IAR 1967-68), Sanganakallu (Ansari & Nagaraja Rao,1969), T. Narsipur (Seshadri, 1971,1995), Hallur (Nagaraja Rao, 1971), Banahalli (Krishnamurthy,1971,1990), Kodekal (Paddayya, 1973), Hemminge (Hanumantha Rao & Nagaraja Rao, 1974), Jami (Ramchandrayya & Subrahmanyam,1976), Palavoy (Rami Reddy, 1976) and Hullikallu (Krishna Sastry, 1979), Veerapuram (T.V.G Sastri, 1984), Terdal (Sundara, 1987) and Budihal (Paddayya, 1993). Research based on new methodologies, focused on theoretical perspectives began to emerge in the recent years. Among them the works of Paddayya (1993a, 1993b, 1995, 1998, 2001, 2002a, 2002b, 2005, 2011, 2013, 2015), relationship between ash-mound and landscapes. Fuller (1999, 2001, 2003, 2004, 2006, 2009 2011, 2014; Fuller et al. 2001, 2004, 2006, 2014, 2015, 2016,), focused on lithic production and archaeo-botanical remains to reconstruct the development of agriculture. Boivin, emphasised on (2004a, 2004b; Bovin et al. 2002) the role of rock art and its landscapes. All the above studies contributed to better understanding of the Neolithic archaeology in South India.

Previous Studies in the Study Area

The south-western part of Andhra Pradesh is well known in the context of Neolithic culture in South India. Bruce Foote (1914) was the first to report the Neolithic remains from Anantapur, district. His collection which appeared in catalogue titled "*Indian Prehistoric and Protohistoric Antquities of India*," mentions more than two hundred

Neolithic sites distributed in South India, out of which seventeen Neolithic sites were located in the Anantapur, district. Later, Major Wauchope made a discovery of two Neolithic celts from Rayadrug.[78] After Bruce Foote, the research on archaeology of the district remained null, until, the first systematic attempt to study the prehistoric cultures of the region made by V. Rami Reddy who published "*A Study on the Neolithic Culture of Southwestern Andhra Pradesh*," in 1978 that furnish the discovery of Neolithic sites and also ash-mound sites in the area. This report on excavation at Palavaoy, was published in 1976 in the *Andhra Pradesh Archaeological Series.* The Palavoy excavation revealed three phase, Pre-Neolithic (Palavoy I), Neolithic (Palavoy II), Post-Neolithic (Palavoy III) and the C-14 of late Neolithic level revealed 1965 BC, based on this he indicated, Palavoy represents an early phase and corresponds to the Period I of Allchins, three divisions of the southern Neolithic culture. Hulikal ash-mound excavation in 1978, by Krishna Sastry, highlights the hypothesis of the importance of cow dung among the Neolithic communities and the Chenchus, the tribal communities inhabiting the present area. Karketiya Sharma,[79] also brought to light the Neolithic-Chalcolithic distribution with topographical details of sites from the study area.

The rock art sites constitute only a minor part, but its presence is significant to explain the Neolithic artistic tradition. The rock art of the study area is dominated by bruisings of cattle images, a common subject matter in Neolithic rock art of South India. In 1986 N. Chandramouli undertook Master of Philosophy and Ph.D. topic focussing on the rock art sites of Andhra Pradesh. In the subsequent years a series of

[78] V. Rami Reddy, *A Study of the Neolithic Culture of Southwestern Andhra Pradesh* (Hyderabad: The Government of Andhra Pradesh, 1978), 3.

[79] I. K. Sarma, "Neolithic-Chalcolithic Cultures in Andhra Pradesh," in *Pre and Protohistoric Andhra Pradesh Upto 500 BC*, ed. M.L.K. Murty (Chennai: Orient Longman, 2003), 96-97.

work on rock art of the region were published by him. He discovered the Budagavi rock paintings located in the present research area of Anantapur district, which was published in 1991 titled 'Rock Art of Budagavi, Anantapur District, A.P.' in *Man and Environment*, XVII (2). Later, in 2008, first systematic documentation of the Andhra Pradesh rock art, based on ecological context of each site was published under IGNCA Rock art series, "*Rock Art of Andhra Pradesh: A New Synthesis,*" in 2013, by Chandramouli. Periodic reports are seen from the works of scholars like Rami Reddy, Krishna Sastry, Venkata Subbaiah, *Indian Archaeology: A Review*[80] and *Andhra Pradesh Archaeology Review*,[81] on reporting the evidence of rock art sites. At present, except for the profound study of the rock art by Chandramouli, no attempt has been made to fully study the known rock art sites. Hence, the present study also tries to study the rock art in the study area by proper documentation, as a result of which a chapter of the thesis is dedicated to findings of rock art.

The meagre information on the Neolithic culture of the study area and not to mention the unavailability of written material required extensive field work. The present research based on regional approach, is directed towards an intensive exploration in Hagari and Upper Pennar, to highlight the Neolithic culture and its aspects.

Aims and Objectives

The Southern Neolithic culture with its distinctive features of indigenous character, despite its rather late date and slow dispersal from small centres is thus undoubtedly one of the best researched region. Nevertheless, the rich archaeological remains

[80] *Indian Archaeology: A Review*, (1959, 1963, 1967, 1973, 1974, 1976, 1977, 1983).

[81] *Andhra Pradesh Archaeological Review*, (1988, 1992, 1993).

suggests distinct patterns. In the recent years, the growing body of researches in prehistory provides mind blowing insights to investigate cultural processes and development of the Neolithic communities. Emerging studies on archaeobotanical remains suggests indigenous cultivation system and that it precedes sedentary life in the region. Therefore, it becomes intriguing to study the Neolithic cultural pattern of this area. Taking clue of evidences, the study region stands no different in the potentiality of Neolithic remains. In fact, the Upper Pennar (present study area) region falls under one of the nucleus area of the southern Neolithic culture. This was one of the priori reason that prompted the selection of the region to investigate. The present exploration on thirty seven Neolithic sites of the study area and the archaeological data recovered from the sites form the framework of this thesis. The thesis is an attempt to highlight the Neolithic cultural pattern as the evidences allows in Hagari-Upper Pennar region with the following objectives:

- One of the aims in this thesis are locating sites, and to derive the distribution pattern in Hagari-Upper Pennar basin.
- Interpretation of archaeological data to get better understanding of the material culture and subsistence pattern of the Neolithic people of Hagari- Upper Pennar basin.
- To analyse the use-wear pattern of the ground stone tools and correlate with the typo-technological aspects in order to determine the possible functions of the tools.
- Documentation of the rock art and its relationship with socio-economic fabric and interaction with landscape.

Methodology

As mentioned earlier, one of the main focus of the study is to investigate the distribution of the Neolithic sites in the research area, the primary method adopted was to conduct intensive exploration to locate and to recover the archaeological data spread in the landscape. Central to this survey has been the use of various topographic sheet maps and census maps to identify the location of sites. Accordingly, each site was visited for proper documentation. Often topography plays a vital role in accommodating a site, hence spatial data of each site was recorded to understand the location dynamics and the factors that conditioned the given location to be chosen for settlement. The interpretation of the archaeological data obtained from the field work forms the main source of the present study. However, considering the large data it was not feasible to achieve the objectives with just one method and hence various methods were adopted to deal with each analysis, of which detailed methods followed are given in specific chapters. To achieve the objectives of the study, following methodologies were adopted:

- Textual references of published literatures, exploration and excavation reports related to the research are referred in preparation of the thesis.
- The artefacts and other archaeological data recovered from the field are studied using dual approach: First, the typological analysis examines the basic morphological characteristics with metrical measurements using electronic digital calipers as well as typo-technological characteristics, relevant drawings of artefacts, photographic documentation and diagram illustrations; second, use-wear analysis is employed through use of microscopic examination to correlate the typological function of tool with micro-wear patterns. This is done because typology assumes an

important role, and thus combined together allows a broad and complete interpretation of the tool use.

- Digital Elevation Model (DEM) approach was adopted to understand the terrain analysis of the study area. The sites own location i.e., elevation of the located site was taken as the main parameter. The method also involves the integration of various softwares like QGIS and Surfer8 to generate the DEM image and Nationl Remote Sensing Agency (NRSA) Bhuvan data to obtain the contour elevation of the region. The combined data base proved successful to understand each site characteristics better and know the precise terrain preferences in selection of the location.
- In the case of rock art, the first step includes proper documentation by using digital camera and recording of the spatial location. However, few of the depictions were too faint to identify and in those cases transparent sheet were used to trace from recorded images.

Limitations

One of the major problem faced during the survey was the prevalence of human intervention in the form of land encroachment for cultivation and commercial granite quarrying which posed a serious threat in locating the Neolithic sites and collection of archaeological data. In few cases, the earlier reported sites could not be located even after spending days of search. Another, difficulty was the rough rocky terrain combined with thorny bushes of acacia, which are almost inaccessible. For example, the rock art sites in the area are located at the top of the high elevated terrain and reaching them was strenuous and laborious which involved climbing the high cliff of

the granite outcrop. Despite the many restraints the present work is an attempt to conduct a systematic documentation of the Neolithic remains of the region, before the evidences are erased completely.

Plan of the Thesis

The thesis titled "Neolithic Culture in Hagari-Upper Pennar region: An Archaeological Investigation" is an attempt to document the Neolithic sites through an exploratory work carried out in the region. The present thesis, thus, is structured based on the archaeological data recovered from the explored sites, to understand the distribution pattern of Neolithic sites, material culture and the subsistence aspects. The thesis is divided into seven chapters.

Chapter 1: Introduction

The first chapter of the study introduces the topic of the present work. It also emphasises on the theories of Neolithic transition and its development in different regions of the world. The chapter also gives a brief overview of the research history, central to this is review on the past studies done by different scholars of the Neolithic developments in south India and in particular the study area. The review on the works suggest indigenous development of the south Indian Neolithic with distinctive features of ash-mounds tradition and the evidence of native crop cultivation systems. Although, debates does exists as to whether they were indigenous evolution and the role of external influences involved in the process cannot be overlooked, the fact remains with the evidences of potential Neolithic sites and the sufficient material data recovered, that Neolithic culture is a watershed in human history, which brought profound changes in human lifestyle. The objectives of the study, the problems faced during the

investigation and the methodologies adopted to achieve the objectives of the present research are discussed in the present chapter.

Chapter 2: Geophysical Character and distribution of the Neolithic sites of the Study Area

This chapter tries to understand the cultural-historical processes and human land interaction, focussed on the ecological settings of the study area. A detailed discussion has been made on the geophysical features, geology, climate and vegetation, soils and water resources of the region. Further, a detailed description of the explored Neolithic sites with aspects of site location, habitational deposits and the archaeological data recovered from the surface of the sites is outlined here.

Chapter 3: Locational Analysis of the Neolithic Sites

The chapter proposes the approach of DEM, to study the location of Neolithic sites in given terrain. Using integrated scientific approaches, the location of sites are studied with detailed DEM surface image combined with terrain parameter attributes to bring out the different aspects and factors involved in choosing the location of the site.

Chapter 4: Classification of Artefacts from Surface Collection

A detailed analysis of the artefacts collected from the surface of the explored Neolithic sites are discussed in this chapter. The chapter deals with the classification of the artefacts i.e. stone tools and pottery based on typological analysis. The basic morphological characteristics with metrical measurements as well as typo-technological characteristics, relevant drawings of artefacts, photographic documentation and diagram illustrations are discussed here. A detailed description of each specimen is included in this section.

Chapter 5: Use-wear Analysis of Ground Stone Tools

The chapter is attributed to use-wear analysis of ground stone tools with the chief question what was the use of the tool? The cutting edges of the tools are examined using digital stereo microscope. The worked material and suggested function of the tool are described. A correlation between typology and micro-wear tools is made on the basis of the wear traces revealed.

Chapter 6: Documentation and Analysis of Rock Art

This chapter presents the documentation of the rock art sites of the study area. It also outlines in brief the previous research on rock art, content of the rock art and motif analysis. The rock art content are dealt separately under headings Petroglyphs and Pictographs grouped into various subject matters. The rock art setting, scenes in depictions are studied to reconstruct the subsistence and ritual practises. Attempts have also been made to see the rock art and its relationship with landscape.

Chapter 7: Conclusion

The final chapter of the present research done in Hagari-Upper Pennar region, contains summary of the thesis and conclude with the findings of the study and its results. It also includes a discussion on the salient features of the work, the primary focus of the thesis.

CHAPTER 2

Geophysical Character of the Study Area and the Distribution of Neolithic Sites

Introduction

The physiographical and geological settings in the long run have greatly influenced the human-biosphere interaction. To understand the historical-cultural processes involved in any given region, it is important to understand the ecological settings, to know its potential resources; as to what made the early human community select a particular area for their settlement or was it a mere random selection? Keeping in view of the above, a brief discussion on the regions physiographic features are discussed here.

Anantapur, believed to have acquired its name from 'Anaatasagram', a big tank, which means "Endless Ocean"[1] lies between 13°41' and 15°14' north latitude and 76°47' and 78°26' east longitude, as a whole is considered as a prolific field for research in archaeology. It is situated in western part of the Deccan plateau and the district roughly oblong in shape with the longer side running north to south is confined to south-western part of Andhra Pradesh. It is bounded by Kurnool, Bellary on the north, Cuddapah, Chittor on the East, and on the south and west side bounded by Karnataka state. The total geographic area of the district is "19,130 sq km and has a population of 40, 83,315 according to 2011 census."[2] The peneplain consisting of the undulating plain and the hill ranges that pass through determines the main physical

[1] S. Kasipiandian*, Directory of Monuments: Antiquirian Remains of Andhra Pradesh, Anantapur District, Vol-1* (Hyderabad: The Government of Andhra Pradesh, 1993), 1.

[2] District Census Handbook Anantapur, Census of India, 2011. http://www.censusindia.gov.in/2011census/dchb/2822_PART_B_DCHB_ANANTAPUR.pdf.

features of the region. Though the hills stands in no comparison with regard to size, height or thickness to its neighbouring Cuddapah, but are found to be present everywhere in varying sizes covered with heaps of granitic boulders the representative rock types belonging to Dharwain age groups.

There are five distinct hill ranges - the Muchukota range extending north from Tadipatri taluk, Gooty and Anantapur, and connecting the Erramalais with a surface elevation height of about 610 m above sea level. The Nagasamudram, Mallapakonda and Penukonda hills are the other range of hills that pass through the district. Besides the above, there are a number of isolated peaks and rocky clusters devoid any vegetation thin and scanty forest viz., "the huge Gooty rock with an elevation of (641 m), the Kundiripidurg (911 m), and the Devadelbetta (740 m),"[3] are the Orographic formations in the region. Thus, the physiography of the region is marked by arid climatic conditions wherein out of total geographical area hills and ridges cover 14 percent; undulating lands 27 percent; gently sloping lands and very gently sloping plains extend over 54 percent; and valleys cover 5 percent.[4] These hills known as '*Konda*'[5] in the regional language have "a deep penetration in the cultural horizon of the region that many names of the present human settlements are suffixed with them such as Hanamkonda, Uravakonda, Pattikonda."[6] An interesting feature noticed is that very often the *Kondas* serve as basements for the erection of temples as is seen even in the present day. So without much doubt it might have served as abodes for the

[3] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh* (Hyderabad: The Government of Andhra Pradesh, 1978), 6.

[4] R. Rukmani and Manjula M., *Designing the Rural Technology Systems for Mitigating Agricultural Distress: A Study of Anantapur District, Research Report No. 24* (Chennai: MSSRF, 2010), 15, PDF e-book. http://www.mssrf.org/sites/default/files/Study-of-Anantapur-RR10-24.

[5] Local name for Hills.

[6] S. A Rahman, *The Beautiful Andhra Pradesh* (New Delhi: Reference Press, 2005), 7.

prehistoric ancestors, combined with the favourable geological features that supplied the raw materials for tools. The physio and orographic settings of the region share similarity to neighbouring Bellary and Raichur districts.

Geology and Minerals

The geological formations have always had strong ties with Archaeology, especially 'prehistoric archaeology' and play a significant role in constructing the idea of human antiquity and provided the basis to understand the progress of humanity in which its ancient cultures existed.[7] Together with its principles, help in indirect dating and relative age calculation of sites and artefacts. All the stone objects of the ancient past evident on the surface today originally come from geological source, most of which served as a raw material for artefacts to the prehistoric people. Thus, while studying the geophysical settings of a region it is very essential to give emphasis to the solid geology of the area under study for a better understanding of the availability of the rock types. That gives a clearer picture of how the readily available rock formations served the prehistoric man and to what extent the raw materials were put to use until the final production of the tools. The region is characterised by peninsular shield,[8] originated during the various epochs of the earth's evolution of geologically ancient rocks of diverse origin which have undergone long ages of denudation. The region is characterised by the presence of large variety of rock type's viz., the Archeans, the Dharwars, the Cuddapah and the Kurnools. Interestingly, the rock formations are unevenly distributed throughout the region which show certain lines of demarcation between the taluks, for example, the main formations being the Archean and

[7] Fekri A. Hassan, "Geoarchaeology: The Geologist and Archaeology," *American Antiquity* 44, no.2 (1979):267, http://www.jstor.org/stable/27907.pdf.

[8] A term used for geologically very old and tectonically stable area.

Dharwars which occur all over the district while the two later formations found exclusively in Tadpatri and east of Gooty and Anantapur.

The Archean group, one of the oldest groups of rocks are exposed on the "northern part of Gooty and Uravakonda taluks, west and north-west of Anantapur taluk, east and south-west of Kalyandurg taluk and western part of Dharmavaram and Rayadurg taluk."[9] The rock forms the extension of the north-eastern part of the peninsular shield.[10] The Archean group which occupies a major dominant portion of the region consists of a heterogeneous admixture of a variety of metamorphic rocks- a representative rock types belonging to Dharwarian formations, the common among which are "dolerite, schist, chlorite granulites, banded ferruginous with intercalations of quartzite, hornblende schist, quartz granulites, amphibolites, metagabbro and metadolerite."[11] The Precambrian metamorphic rock of igneous grey and pink coloured granite and granitic gneiss, pegmatites, and epitode granite are found through the Archean rocks on the southwest parts of the region viz., "Togarakunta and in around Nasanakota."[12] The origin of these rocks is believed to be from granite outcrop, as geologically the area is traversed by several granite veins. The ridges of exposed hornblende schist which constitute the granitic gneiss are spread in narrow bands along the Katrimala reserved forest and west of Ramagiri known for its gold resources. Ferruginous quartzite occurs in the forms of bands east of Kuderu and west of Talupuru and to the north-east of Velpumadugu, pockets of haematite quartzite and red oxide are found at several places across the rock.[13] The dykes of dolerite occur in

[9] S. Kasipandian, *Directory of Monuments: Antiquirian Remains of Andhra Pradesh,* ii.

[10] P. K. Raman, *Geology of Andhra Pradesh* (Bangalore: Geological Society of India, 1997), 10.

[11] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh,* 7.

[12] Ibid.

[13] Ibid.

distinct contact with the Archean rocks,[14] forming crest ridges on top of many hills, a striking feature of the landscape.

The sedimentary rocks of "Purana group" of 'Cuddapah and Kurnool' occur along the northern part of region, represented by "Pulivendla quartzite and Tadpatri shales."[15] The former consists of "medium to thick bedded well sorted quartz arenite with sparse pebble beds in the basal part. The Tadpatri shales are heterolithic shale of fine calcareous sandstone and thick bands of dolmitic limestones."[16] The shales form an intrusion into trap dykes which give rise to clay beds with the appearance from brown grey to purple colours with noticeable joints.

The Kurnool series of the sub groups the Banganpalle quartzites consists of dark red, grey or brown sandstone which is coarse grained and gritty with beds of conglomerates and basic intrusive rocks. It is feldspathic and ferruginous. The sediments mainly made up of quartzite and coloured cherts are hard and resistant to weathering which act as barriers. The Banganapalli conglomerate is an important economical resource for its content of detrital diamonds for the region. The former series is overlain by the "Jammalamadugu series, which consists of Narji limestones,"[17] fine grained and highly siliceous limestone with pink and purple colour, gritty ferruginous sandstone. This high grade calcareous flags are mined as flooring and roofing material.[18]

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[14] P.R.C. Pahani, "Geological Excursion to Eparchaean Unconformity at Namalagundu, Anantapur District, Andhra Pradesh, India," http://www.earthscienceindia.info/pdfupload/esi_geosites_1.pdf.

[15] S. Kasipandian, *Directory of Monuments: Antiquirian Remains of Andhra Pradesh,* ii.

[16] Dilip Saha and Vikash Tripathy, *Palaeoproterozoic sedimentation in the Cuddapah Basin, South India and regional tectonics: A Review* (London: The Geological Society London, 2012), 166.

[17] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh*, 8.

[18] P. K. Raman, *Geology of Andhra Pradesh,* 127-128.

The region has major potential for mineral resources due to its strategic geographical location in peninsular shield encompassed by major terrain of Precambrian rocks. Mining is an important activity of the region as it is endowed with rich deposits of iron ore and lime stones, as well as other minerals. Of the many minerals found in the region important among them are "gold, diamonds, barytes, asbestos, steatite, limestones, clay, iron ore and soap stone."[19] The region accounts for the highest share of the mineral wealth contributing to the state economy. The important among them; the copper mountain in Rayadrug, contributes about "94.3% of the total iron ore mined in the state during (1966-1977) as per the reports."[20] The barytes minerals are found abundantly at Muchukota and Venkatampalle,[21] the schist belt near Ramagiri is known for gold content, the best quality limestone occurs in Tadipatri taluk,[22] and "soap stone is available at Chandrapalli, Janamredipalle, Nerijumpalle and Julekalava."[23]

Climate and Vegetation

The region has semi-arid subtropical monsoon climate. Due to its geographical location it does not get the full benefit of either of the monsoons. The south-west monsoon gets cut off by the Western Ghats, while it is deprived of the benefit from north-east monsoon, as being located far from the eastern coastline. Being the driest arid district in the state, it receives a meagre rainfall. The normal rainfall is 563 mm,[24]

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[19] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh*, 8.

[20] S. A. Rahman, *The Beautiful Andhra Pradesh*, 12.

[21] S. Kasipandian, *Directory of Monuments: Antiquirian Remains of Andhra Pradesh,* iii.

[22] Ibid., ii.

[23] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh*, 8.

[24] L.G.K. Naidu, *Soil Resources of Anantapur District, Andhra Pradesh*, NBBS Report no. 1017 (Bangalore: ICAR, 2008), 3.

by which it secures least rainfall when compared to Rayalseema and other districts of the state. The rainfall is not uniformly distributed in the region. The areas of "Gooty, Kadiri, Hindupur, Madakasira and Penukonda"[25] receives slightly more than other areas. The region experiences hot summers and mild winters. The hot summer season or the pre-monsoon period starts with a sharp rise in the mean maximum daily temperature during the month of March. Then the temperature shoots up to 42˚C s during April-May, the hottest month throughout the region. The scorching heat and hot winds make the season uncomfortable. The cold winter season is experienced for a short span during the month of December-January with 20˚C temperature. The humidity varies from "75 to 85 percent in the rainy season of May and June. During the Wind."[26] Geographically, being situated on the boundary of semi-arid zone and deprived of rainfall, the agriculture condition is characterised by high levels of instability and uncertainty leading to drought and famine. Thus, the region characterised by hot dry climate and the rapid changes in temperature during summer from hot days to cold nights might have contributed to weathering of granite rock.

The natural vegetation consists mainly of dry deciduous to thorn scrub jungle. The region is deprived not only of the benefits of monsoon but has scanty natural vegetation. The "area under forest is mere 10.1 per cent of the total geographical area and they are of open coarse canopy, mostly restricted to hilly terrain and hillside slopes."[27] The common species found in the region are drought resisting plants such as; "*Acacia arabica, Zizyphus jujuba, Elate sylvestris, Cassia auriculata, Carthamus*

[25] Ibid., 10.

[26] Katta Satya Sai Prasad et al., "Study of Hydrometeorology in a Hard Rock Terrain, Kadiri schist Belt Area, Anantapur District, Andhra Pradesh," *Open Journal of Geology*, no.2 (2012), 294, http://www.SciRP.org/journal/ojg.pdf.

[27] L.G.K. Naidu, *Soil Resources of Anantapur District, Andhra Pradesh,* 4.

tinctorius and Tortollis euphoriba etc."[28] The *Acacia arabica* locally known as '*Tumma*' usually grown on black soils near nullahs are used for multiple purposes; the bark of these tress is used in tanning and for medicinal use; its wood used for making daily agricultural implements and for fire woods. Besides, the cactus plants abound in the granite hills of the region.[29]

Soils

The soils of the region are mostly residual in origin. These soils are derived from different land forms, "the granite and granite-gneiss, as well as the Dharwar landforms."[30] Based on, physiographic landforms, the soils of the region are broadly divided into two categories: "Soil on the hills and ridges; soil on undulating and gently sloping low lands."[31]

Soil on the hills and ridges

The soils on this landform as the name appears is characterised by granite and granite-gneiss and covers a major portion of the region. The soils are derived from gneisses or from the sediments. These soils are generally "shallow, reddish yellow in colour, loamy, clayey"[32] and are subject to erosion. The red colour is due to iron present in the state which is the product of weathered gneisses and granites. These soils on the whole are deficient in organic matter and have poor moisture retention. This soil can be cultivated only after adopting improved techniques and inputs of organic fertilizers to

[28] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh*, 11.

[29] Ibid.

[30] R. Rukmani and Manjula M., *Designing the Rural Technology Systems for Mitigating Agricultural Distress: A Study of Anantapur District,* 20.

[31] Ibid.

[32] L.G.K. Naidu, *Soil Resources of Anantapur District, Andhra Pradesh*, 8.

be productive. Majority of the Neolithic sites of the study are found developed on this soil.

Soil on undulating and gently sloping lands

The soil of this lowlands and valley consists of transported materials deposited with alternate layers of sand and silt from the hills. These are "sandy, sandy-clayey in texture and darker as compared to the recent alluvium deposits of sandy texture and lighter colour."[33] The alluvial soil occurs along the banks of the rivers in the area. The texture of the soil is blackish which may be due to the presence of organic matter. This is the most fertile soil in the region for cultivation. The banks of the rivers are covered with black cotton soil, with evidence of meagre red soil near the hills.

Besides, the above categorisations there are about thirty four traditional soil families in the district. The most distinct varieties are, "red alfisol soils predominates the region accounting for 78 percent, while black soils are found in 20 percent."[34] The sandy loam covers 63 percent of the total geographical area; 14 percent is under rock land; and under clay 19 percent. Major part of the region is dominated by coarse soil texture that are poor in water and nutrient retention, and are prone to wind and water erosion. The strong westerly winds that blow across the region are also a factor that contributes to soil erosion.[35]

[33] Ibid.

[34] R. Rukmani and Manjula M., *Designing the Rural Technology Systems for Mitigating Agricultural Distress: A Study of Anantapur District,* 21.

[35] Ibid.

Rivers

The region is not drained by any major river system. The four rivers which run through the district are "Pennar, Chitravathi, Vedavathi or Hagari and Papaghni."[36] Interestingly all these river systems are non-perennial and have their origin in the neighbouring state of Karnataka. The 'Penneru' or 'Pennar' the largest river in the district has its origin in the Chennakesava hills of Karnataka and drains into north-west direction, where it is joined by the tributary of Kumudvati in Hindupur taluk. The river Chitravati second largest with its tributary Kushavati flows further east till it enters Dharmavaram taluk, where it serves as a good source of irrigation with its spring channels. The Hagari or Vedavathi with its tributary Chinna Hagari is another significant river that passes through Rayadurg, Kalyandurg and Kadiri. It flows due north in a wide shallow sandy bed and re-enters its origin state and joins the river Tungabhadra. The Papaghni is also another important water source of the region.[37]

As mentioned earlier, though the region is deprived of perennial source and the major river systems have their origin in Karnataka state, with its tributaries, it successfully carved out a number of wide valleys which in due course created a number of spring channels and small water ways, an important feature of the region. It is worth mentioning here that almost all the Neolithic sites in the region are found around the Hagari and Upper Pennar river valleys.

[36] L.G.K. Naidu, *Soil Resources of Anantapur District, Andhra Pradesh*, 10.

[37] S. Kasipiandian*, Directory of Monuments: Antiquirian Remains of Andhra Pradesh, Anantapur District*, 11.

The Neolithic Sites and their Topographical Settings

Introduction

The archaeological potentiality of the region is well known in the context of Neolithic culture in South India. The researches in the prehistory of the region is seen in the pioneering work initiated by Bruce Foote, during the early part of the 20th century. Works on extensive exploration by Rami Reddy in the later century, and also by the State Department of Archaeology and Museums, in their village wise survey led to the discovery of multiple new Neolithic sites, thus adding to the long list. The earlier reports mentioned more than fifty Neolithic sites,[38] with evidence of various types of ground stone tools geographically distributed in the region. Mentioned can also be seen in Paddaya, regional variant theory of southern Neolithic culture, who placed the region of Anantapur (the upper Pennar river) among the nuclear zone in south India as a whole.[39] These collection, thus, served as a good evidence and the significance of the wide distribution of the Neolithic culture spread across the study area.

Based on the earlier works and references of the region, an intensive and systematic investigation was carried out in the Anantapur region, for the present work. The present investigation was carried out during 2013-2016. One of the major plan of the investigation was to document the maximum number of Neolithic sites spread across this landscape. In doing so, the sites reported by earlier researches were revisited and effort was made to gather as much data as possible from the surface study. A total of 52 Neolithic sites, reported were listed and visited for the present

[38] S. Kasipiandian*, Directory of Monuments: Antiquirian Remains of Andhra Pradesh, Anantapur District,* iv.

[39] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis* (New Delhi: Aryan Books International, 2013), 73.

study. However, during the investigation, it was seen that the quarry works and land encroachments have tremendously damaged some of these sites. This prompted the need to document at least the existing sites as far as possible and do a systematic study of the Neolithic culture. This resulted in the study of thirty seven (37) existing Neolithic sites, with evidence of data collected in the form of artefacts, presence of ash mounds and rock art sites. A detailed description of the explored sites and its findings will be discussed in the next section of this chapter.

The sites considered for the present study are located in a stretch of area between the reaches of river Hagari-Upper Pennar region. These two rivers originating in Karnataka along with its tributaries are the major source of water for the region. The area is characterised by high plateau, generally undulating with large granite hill ranges and alluvium sequence. All the 37 Neolithic sites of the area are developed around the hill slopes and foot hills within the reach of locally available resources for manufacturing the tools. The dolerite being the chief raw material for making all the ground stone tools, are extensively found in the form of dykes in the region. Further, the settlements found along the perennial rivers and seasonal streams a chief feature of the Indian Neolithic in general,[40] no doubt, is seen in the present study and this could be one of the probable reason for the evidence of numerous Neolithic sites located near the vicinity of water sources. The Neolithic sites of the study area present a potential degree of variance in artefacts, all collected from the surface.

The topographical setting of the thirty seven (37) Neolithic sites, considered for the present study is described below.

[40] Ibid., 75.

Peddadandukonda

The site located at (14.819685 N 77.627693 E) is about 1.50 km east of the Jambuladinne village and about 3 km east of the nearby Anantapur-Gooty road. On the west of the site and right on the periphery of the existing village is the 'Singanamala Cheruvu' which lies at a distance of 2 km away from the site. The Garladinne-Singanamala gravel road passes by the south of the site.

The site is located on a castellated granite hill locally known as '*Peddadandukonda*'. The average altitude of the site is 379 m from mean sea level (MSL) on a low relief terrain. It is covered with dense vegetation of thorn shrub bushes and poor red soil. The top of the hill had evidence of flat terraces, which could have been a habitation area. In the present survey, two celts were found from top of the hill near the flat terraces, where the present ongoing quarrying work has destroyed most of the habitation area. The tools are found scattered at the foot of the hills. A total of 24 stone tools were collected, which include 17 stone balls and 7 axes. Surprisingly, ceramic evidence is scarce, though it was mentioned in the earlier reports. The reason could be due to frequent ravaging of human vandalism. The area yielding artefacts measures roughly 24549 sq m. Given, the nature of spatial distribution and the quantitative occurrence of artefacts suggest that this site was occupied as transitory camp for procuring and manufacturing the tools.

Chakrayapeta

About half a kilometre south-east of the existing village in Singanamala Mandal, is noticed the Neolithic site (14.77142 N and 77.75286 E) in the slopes of a hill locally known as '*Devarakonda'* (Plate-1). The average altitude of the area is 309 m from mean sea level (MSL). The site extends over an area of about 1948 sq m on the foot of the hill surrounded by agricultural fields of black soil. The exposed section of the

habitation deposits measures 2.5 to 1 m depth. In consequence of the continuous cultivation of the area, the soil of the site was eroded which might have resulted in the exposure of the artefacts on the surface. It yielded 27 stone tools and a variety of ceramic wares. The miniature celts, finely polished and smaller than normal size are one of the interesting fact. The concentration of the artefacts is higher on the present cultivated field, than is usually on the foot of hill. This might be due to cultivation operations where the top soils of the foot hill are carried down in the process. Taking into account the spatial distribution and site extent, the site proved to be quite potential with deposits of successive culture as is indicated by the presence of black and red ware and other wares assignable to later periods. The '*Chenampally Cheruvu'* and '*Kuthaleru*' river situated on north-west at a distance of 0.52- 1.15 km from the habitation seems to have served the source of water supply for the Neolithic communities as in the present day.

Budedu

The site is situated at (14.85348 N and 77.55501 E), about 1 km North of Budedu village towards Krishnapuram in Graladinne mandal. The general altitude of the area is 327 m above mean sea level (MSL). It is surrounded by cultivated fields of black and red soil. The name of the village itself suggests the accumulation of ash i.e. '*Budida*' meaning 'ash' as known locally. Though, reported earlier as a potential and extensive habitation site, in the present exploration no evidence of such has been reported except a solitary broken stone ball and few red slipped wares. The reason could not be ascertain as to how once an extensive site with great potentiality is destroyed with just a stray find. This could be either due to present human vandalism or the deposits being destroyed by farmers to extend the area for cultivation as is the case in many of the sites.

Karakamukkala

This village is about 6 km south-west of Vidapanakal. The site (15.00881 N and 77.15504 E) on a hill top west of the village, with a general altitude of 515 m above mean sea level (MSL), is noticed rock bruising (petroglyphs) on a flat granite rock surface. The image of 'circle with a trident' and 'chakra' is found on the same flat rock. As per the local information the former images is of '*Pīrladevudu*' meaning '*Pīrla'* 'male' and '*Devudu*' for 'God'. The area is rugged terrain with scattered boulders and covered with dense shrubs. The presence of two '*Cheruvu*' on the foothill is one of the distinctive features here. The '*Reddy Gari Cheruvu'* on the northern most is at a distance of 0.49 km and '*Vakkireni*' on the south at a distance of 0.20 from the site. The soil of the surrounding area is predominantly black and red soil. The site first explored by Foote[41] and later by Rami Reddy,[42] who reported on the evidence of habitation deposits could not be traced, except sporadic pottery in the present investigation.

Gotukur

The Gotukur village in Kudair mandal is situated at a distance of 13 km from Anantapur on the road to Bellary. The site (14.72948 N and 77.51915 E) is located about 1 km south of the village at the foot of a hill called '*Pathoorigutta*'. It is surrounded by cultivated fields of red soil and thin scrub vegetation. The northern slope of the hill yielded two stone balls of dyke and olivine. There were no remains of habitation deposits as was reported. The reason could be due to the present ongoing quarry work which has destroyed most of the surrounding vicinity around the foot of

[41] R. Bruce Foote, *Prehistoric and Protohistoric Antiquities of India* (Delhi: Leeladevi, 1916), 103.

[42] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh*, 23.

the hill. Nevertheless, the site as being once occupied by the Neolithic people is supported by the present stray finds of its cultural affinities.

Donekal

The site situated (15.08033 N and 77.11729 E), is about 1 km, north-west of the Donekal village in Vidapanakal mandal. The general altitude is 429 m above mean sea level (MSL), surrounded by agricultural fields of black soil. On the north is a big granite hill followed by several hillocks towards west, covered with dense scrub bushes. The dry bed streams of river Vedavati flows along the northeast of the hill. The habitation deposits extends over an area of about 32374 sq m. The visible section deposits measures about 5.5 m depth in eastern slope and western section with 1.5 m depth from the ground level. Considering the depth of the deposits, it appears that much of the actual Neolithic deposits is not yet disturbed. Thereby, the site could be regarded as important and potential for further studies with systematic excavation work. Since, the deposits were intact not much artefacts were found from the surface. The finds were stray with 3 stone balls made of olivine. Shreds of grey ware and red slipped ware are found scattered extensively on the site.

Antraganga

A hamlet of Ipperu village, Antraganga lies at a distance of 30 km from Anantapur in Kudair mandal. The site (14.75950 N and 77.42274 E) with a general altitude of 445 m above mean sea level (MSL) is located on the western side of the village about half a kilometre away. The general topography is plain area with cultivated fields of red soil. A dried up stream was noticed on the north east. The ancient mounds noticed on the western side, according to local information were the remnants of Siva temple, which has now been completely destroyed without any visible trace. The survey in and

around the mound yielded 3 stone balls and 2 celts made of dolerite. Scanty Neolithic wares were found from the site, though wares of later medieval period were witnessed from the surface. Hence, taking into account the findings from the surface and the deposits we may assume that the site was occupied for a shorter time by the Neolithic community which was occupied by the later medieval people.

Peravali

The village is located half a km on the Anantapur-Tadpatri highway road, in Singanamala mandal. The site (14.80052 N and 77.78717 E), with an altitude of 309 m above mean sea level (MSL) is situated at a distance of 2 km north of the village at the foot of a hill known as '*Budida Nela'*. The surface collection yielded only a stray specimen of one stone ball. The site was reported earlier as being potential, as it yielded good number of celts, stone balls and megalithic ceramics. The general topography of the site is on a plain area covered with red soil. Considering the topographic features and the distribution pattern of the site being located in close vicinity to Neolithic site of Chakrayapeta on the south-west of the village within 4 km radius suggests close distribution of Neolithic villages at potential places.

Kamalapadu

The habitation site (15.06234 N 77.40440 E) with an altitude of 465 m above mean sea level (MSL) is on the northeast of the existing village in Vajrakarur mandal. The deposits are in the cultivated fields, just behind the '*Chennakesava*' temple. Neolithic deposits is noticed in an area measuring about 3948 sq m. The site is disturbed due to present cultivation and the fact that being closely located to human settlement the findings from the surface were not satisfactory except some pottery sherds of black

and red ware. The evidence suggests continuous occupation of the site from Neolithic to early historic periods.

Akkamakonda

The site (14.56019 N and 77.12847 E) is located in a steep granite hill about 2 km northeast of Kalyandurg. The hill is known as '*Akkamakonda*' named after the goddess '*Akkamma*' according to the locals. The general altitude of the area is 587m above mean sea level (MSL). The predominant red soil is covered with thorny bushes. The habitation deposit is noticed at the eastern foot of the hill near a deep gorge between two hills. The deposit which now lies in a cultivated field measures about 12140 sq m. The exposed section dug by the local people reveal a thickness of 1-2 m depth. A good number of artefacts were collected from the field, and around the foot of hill. The findings from the surface consist of 10 ground tools, grey wares, red slipped ware, black burnished ware and storage jar pieces. The occurrence of perforated ware, itself suggest the potentiality of the site. The rugged rocky terrain with thorny bushes and availability of raw materials form a suitable habitat besides, perennial water source of Hagari flow through the mandal at a distance of 13 km.

Enugavi

It is situated at (14.36615 N and 77.10135 E), in Kunduripi mandal. The habitation deposit is located between '*Peddakonda*' on northeast and '*Upplitohkonda*' on southwest with an altitude of 665 m above mean sea level (MSL), one of the highest in the region. The western the hill has traces of Neolithic deposits over which thick deposits of later debris are lying. As seen from the pit, the deposits the thickness measures up to 2 m with 6 layers of stratification which vary from 0.60m-0.30 m. This suggests that the site is much intact and well preserved. It is hoped that systematic

study with excavation can reveal more insights of the content inside. The surface yielded artefacts of hopscotch, burnished grey, red wares and, black and red ware. No ground tools were reported from the present survey. The presence of a 'cave' or '*gavi*' know to the locals at the top of the hill with paintings of white pigments belonging to megalithic and later periods indicates the site as being continuous occupation from Neolithic to early historic. The undulating hills with steeper terrain and trap dykes, one of the basic raw material for manufacture of tools, could have provided a suitable habitat for the Neolithic communities. The surrounding area is covered by thick vegetation of thorn bushes and scrub, while below the hill slopes, the land used for cultivation is covered by red soil. Towards 1 km south of the hill deposit flows River Hagari and Radhaswamy Ashram, where the present people of the surrounding villages come for worship and offerings.

Pillalapalikonda

The site positioned at (14.586156 N and 77.013248 E), with an altitude of 524 m above mean sea level (MSL) is located about 1 km northwest of the Pillalapalli village. The hill where the site is located is known as '*Pillalapalikonda*' named after the village. The eastern foot of the hill yielded artefacts of ground stone tools, burnished grey ware, red ware and red slipped ware along with a single specimen of lower Palaeolithic levallois tool. The extent of the area yielding artefacts measured about 12278 sq m. On the eastern slope is noticed a water pond, which as per the local information, does not dry up throughout the year and serves as a source of water for the farmers of the surrounding area. Based, on this we can assume that this might have served the same purpose for the Neolithic communities in the past. The area in general is occupied with thorn bushes and rocky terrain covered with red soils in the plain

cultivated area. The river Hagari which pass through the region is about 5 km on the north from the existing site.

Nimbagal

A habitation deposit measuring an area of 4899 sq m, positioned at (14.88323 N and 77.20736 E) with an altitude of 466 m above mean sea level (MSL) is noticed near Shiva temple south of the Nimbagallu village as known to the locals in Uravakonda mandal. The deposits as revealed from the recent dug up trenches measured about 1 m depth. The surrounding surface yielded artefacts of ground stone tools and pot sherds of red slipped ware, grey ware, black and red ware, painted black on red ware etc. The occurrence of later wares indicates a successive cultural profile of the site. The surrounding area is of plain terrain with thin vegetation of thorn bushes. The predominant soil of the area is black cotton soil. To the north of the site about 0.5 km, towards the village is the '*Peddakunta Cheruvu'* a water source of the village.

Velpumadugu

The village lies at a distance of 1 km from Uravakonda-Bellary road in Vidapanakal mandal. About 0.5 km, east of the village is noticed habitation remains of Neolithic period at the top of granite hill called '*Velpumadugukonda*' (15.05100 N and 77.20721 E) with an altitude of 505 m above mean sea level (MSL). The habitation is located at 30-35 m elevation from the ground level. The habitation debris are wide spread being constantly reduced due to recent diggings, which as a result was hindrance in taking the extent of the area, while the exposed portion of the deposit was measured and the thickness varied from 0.5-1 m. A good number of artefacts were collected from the surface which consists of stone tools of polished celts, stone balls and potsherds of grey ware, hop scotch and red ware etc. Besides tangible material, four rock bruisings

(petroglyphs) were noticed on the granite boulders spread in different locations around the hill. In the vicinity of the present quarry work two huge granite boulders are noticed facing each other in north-south direction depicting bruising of bulls. As per the local information, there were three such similar bruising earlier, but one of them have been destroyed in the quarry work. A little towards south-west in a shrine called '*Munishwaradu*' another bruising of a bull with long horns have been noticed. On the western foot hill is noticed a bruised game board known as '*Puli Judamu,'* in Telugu, on a flat surface of the boulder. They are commonly found depicted in rock art sites of South India as well as Central India.[43] The area being located at a high elevation is rugged and undulating in appearance. The combination of red and black soil overshadows the cultivated plain area. In the north of the foot hill is the '*Nagala Cheruvu'* a lake about 0.31 km from the site.

Gunjikunta

It is situated at (15.01047 N and 77.37625 E) with an altitude of 482 m above mean sea level (MSL), in Vajrakarur mandal. About 1 km north of the village is noticed the Neolithic habitation deposit. The deposit lies in a cultivated field adjacent to the village motorable road. It extends over an area of 8093 sq m in plain area devoid of vegetation with red soil. The surface collection includes polished axe and celts, stone balls made of olivine and pot sherds of grey ware, burnished ware and spouted vessels. The site is relatively disturbed due to cultivation. Though artefacts are found good in numbers, much are broken and badly preserved due to cultivation of the field.

[43] E. Neumayer, *Lines on Stone: The Prehistoric Rock Art of India* (New Delhi: Manohar, 1993), 94.

Kadamalakunta

The site positioned at (14.97474 N and 77.33801 E) with an altitude of 491 m above mean sea level (MSL) is situated in Vajrakarur mandal. It is located about 1 km southeast of the village in a cultivated field. The artefact yielding area measured approximately 11824 sq m. The artefacts were concentrated mainly in the exposed rain gullies south of the site. The surface collections include celts, axes, stone balls and a play marble made of dyke. Majority of the tools were in the first stage of manufacture and the absence of pot sherds from the site suggests that it could have been a factory site or temporary camp. The surrounding area is covered with red and black soil.

Lattavaram

The site (14.92537 N and 77.2761 E) with an elevation of 480m above mean sea level (MSL) is located in Uravakonda mandal of Lattavaram village. About 0.5 km north of the village in the slopes of a castellated granite hill called '*Narasimhapakonda*' is noticed a habitation deposit. The deposit lies in a cultivated field of black soil measuring an area of about 25996 sq m and the thickness of the visible section ranges from 5-10 m. The artefacts of stone tools and potsherds collected from the surface indicates a succession of cultures, upto early historic. The area is covered with thick vegetation of thorn bushes of Acacia. The site also yielded a chopper tool.

Peddamatlagondi

The site is located at (14.82213 N and 77.73522 E) with an altitude of 320 m above mean sea level (MSL) in Singanamala mandal of the Peddamatlagondi village. It is located about 2 km south-west of the village at the foothill known as '*Rishingaswamykonda*'. The slopes of the hill yielded only two specimens of rubber and a small celt made of dolerite. The reason for sporadic occurrence of assemblage,

could be due to the present cultivation in the surrounding area, destroying the remains which has been the case at many sites. The site has both red and black soils. A stream known as '*Javalanka*' flows through the northeast of the hill. The entire area of the hill is covered with thick vegetation and rocky terrain gently sloping towards south of Singanamala lake which is about 3 km away.

Dayyalakuntapalle

The site (14.69823 N and 77.70966 E) with an altitude of 360 m above mean sea level (MSL) is located on a hill slope at a distance of 0.5 km, west of the village Dayyalakuntapalle in Singanamala mandal. To the east of the hill about 1 km away is the '*Chennampally Cheruvu'* which reserves water during rainy season. The hill where the site is located is known as '*Peddakonda*' meaning 'big hill' in Telugu. The surroundings have red soil and the general topography of the area is low elevated, gentle sloping plains. The ongoing quarry work near the hill has completely destroyed the site which in the continuous operations has eroded the top soil and as a result yielded only few artefacts of stone ball and pot sherds of painted red ware from the surface. Nevertheless, the finds do indicate the Neolithic occupation of the site.

Gadekal

The village also known as '*Gadekallu*' lies by the side of Uravakonda-Guntakal road in Vidapanakal mandal. The site positioned at (15.112391 N and 77.241488 E) with an altitude of 471 m above mean sea level (MSL) is located near a granite hill locally known as '*Narriavulagattu*' to the northwest of the village. The foot of the hill has evidence of Neolithic habitation deposits covering an area of 67980 sq m. The height of the deposits from exposed section was about 5-6 m from the ground level. The site has predominantly black soil with cultivated fields around. The entire area is covered

with thick vegetation of thorn bushes. However, a good number of artefacts were exposed on the surface yielding polished axes, stone balls, red slipped ware, black polished ware, round pounder or pot dabber made of dolerite. The most interesting finds are of the latter specimens probably, used by the potters to hold the clay lump of the pot in pottery making. A similar kind has been reported from Piklihal.[44] Since the deposits are extensive and not much disturbed, it could be potential for excavation work.

Budagavi

The village believed to have derived its name from '*Budida*' meaning 'ash deposits' and '*Gavi*' for 'caves' in Telugu is situated at a distance of 6 km west of Uravakonda on the Bellary highway road. The habitation deposits (14.967809 N and 77.233603 E), with an altitude of 475 m above mean se level (MSL) is noticed northwest of the village on the hill slopes called '*Butamalakonda*'. The ashy deposit now lies in a cultivated field of black soil. The spread of the deposits area have been measured approximately 7491 sq m, and about 2 m depth from ground level. From the foot of the hills and near the 'gullies' Neolithic artefacts of polished stones axes, adze, stone balls, stone marble, dull red ware, black slipped ware, red slipped ware with incised design, perforated ware and hopscotch were collected. The top of the hill with high elevation of about 556 m from sea level is covered with thorny bushes and gliding rock boulders of rugged terrain. The granite hillock on its flat top and slopes revealed two rock shelters with paintings. In one of the shelters are noticed rock paintings depicting animals of humped bull, deer, human figure and imprints of left hand in red ochre. Below the rock shelter on a granite boulder is bruising of humped bull and '*Pīrla*' symbol. Another rock shelter to the south of the hill bears figures of five left

[44] F.R. Allchin, *Piklihal Excavations* (Hyderabad: The Government of Andhra Pradesh, 1960), 91.

hand prints and animal figures painted in red ochre. In the flat rock surface of the hill near the vicinity of the rock shelters were noticed cup marks in line and a grinding groove measuring 1.32 m in length and 68 cm in breath. The presence of the grinding stone indicates tool manufacturing site. It is surrounded by two huge granite hills called '*Budagavikonda*' on the south and '*Buthamalakonda*' on the west. The river Pennar locally known as Penneru which flows through the region is about 16 km from the site. The general area shares one of the physiographic division of Andhra Pradesh as interior rugged plain studded with hill clusters constituted predominantly with grey granite.

Peddakonda

The site (15.056429 N and 77.172778 E) with an altitude of 545 m above mean sea level (MSL) is located about 0.5 km west of the Vidapanakal town. The name of the hill where the site is located is known as '*Peddakonda*' meaning 'big hill' in Telugu. The castellated granite hill is rugged and partly undulating terrain with thick bushes of acacia. The soil coverage is black in colour. The rock art at this site is confined to bruising on the flat topped granite boulders at the top of the hill. In one of the highly scribbled flat rock surface which has table like appearance a number of superimposed geometric symbols of 'circle a with trident' in various forms, sizes and shapes were noticed. A 'game board' and a symbol resembling to floral designs are found close to the above symbol. The game boards have been described as 'hunt game' or 'strategy game'[45] probably played by hunters or cattle herders during their wait. Besides these, there are many other patterns, which are difficult to identify. The vicinity also revealed

[45] John. M. Fritz and D. Gibson, "Game boards at Vijayanagara," *Academia. edu* (2010): 65, https://www.academia.edu/12129306/Game_Boards_at_Vijayanagara_2006_?auto=download.pdf.

other images located in different individual rock boulders such as a bull, rabbit, elephant, human figures and few other images. Due to thick patination, it was difficult to identify other figures. The total number of bruising on the site accounts to 20 images. Further the availability of grinding grooves in and around the site and the surface artefactual collections from the foot of the hills add to its importance. The streams of river Hagari that drains the mandal, evidence of a seasonal cistern on the southwest of the hillock makes it a potential source for holistic study.

Hulikal or Hulikallu

The village lies about 2 km on the Kalyandurg-Bellary road in Kalyandurg mandal. The site (14.62087 N and 77.083892 E) with an altitude of 523 m above mean sea level (MSL) is located adjacent to the village road between two hills known as *'Mallapakonda'* and '*Chinnikonda*'. The Mallapakonda which is 1 km north-east of the village revealed evidence of habitation deposits spread along the north and south foot of the hill. The area measured approximately 5281 sq m. A good number of artefacts were collected from the stratified deposits and also from the surface. The ceramics are represented mainly by black slipped ware, dull red ware, grey ware, burnished grey ware and channel spouted bowls. Ground stone tools of axes, adze and stone balls were the other finds. Majority of the tools are half worked which indicates their local origin. The view is supported by the Archean rock formations which consist of gneisses, schists, granites, quartz veins and dolerite dyke, one of the most preferred raw material for manufacture of Neolithic tools. The soil coverage is red sandy; this could be due to the inundation of floods during rainy season and the fact being that Hagari river, one of the major water source of the region lies just about 4 km on the west of the present site. The surrounding area is occupied by gentle sloping terrain towards the river covered by thick vegetation of thorn bushes and shrubs. Thereby, the

ecological settings of the area, raw materials, water source etc would have served as a good habitat for the Neolithic communities.

Mudigal

The Mudigal village also known as Mudigallu is about 5 km east of Kalyandrug town. It is one of the richest archaeological and best preserved in the mandal characterised by Neolithic settlements, ashmound and megalithic monuments. The site (14.54460 N and 77.15570 E) confined to Neolithic habitation deposits is located about 0.5 km on the southwest of the village in a granite hill locally known as' *Mudigallukonda*'. The general altitude of the area is 540 m above mean sea level (MSL). The southern and northern slopes of the hill yielded ground stone tools and a good number of Neolithic potsherds. The evidence of a red micacious ware partially buried in the ground is another interesting find of the present survey. Besides, on the south-eastern side of the hill near the cart tract is noticed a small ashmound with thin ashy deposits which has now merged with the surrounding ground level. Due to its nature of disturbance and other causes it was difficult to estimate the size and thickness of the mound. The megalithic dolmens are located northeast of the village near a modern grave yard. To the northwest of the village in a cultivated field near '*Ramalingswara*' hill is noticed stone circles and menhirs. Most of the structures in the field are now destroyed on account of the continuous cultivation. Thus, if combined all the characteristic evidences then the present site is of great potential for further work to throw light on the past cultures in the area. The soil surrounding the site is red sandy with sparse vegetation of thorny scrubs. The terrain is highly elevated with clustered granite hillocks. The river Pennar which drains through the region is about 15 km on the west of the site. The smaller streams of the river might have drained the surrounding area.

Bunidibba

It is a small village in Vidapanakal mandal. The site (15.07993 N and 77.12306 E) lying at a distance of 2 km east of the village is a habitation deposit. It is a very thin deposit spread in a cultivated field of black soil, measuring approximately 8093 sq m. Due to continuous cultivation much of the deposits are carried away in due course. The surface yielded stone balls, broken celts and red slipped and grey ware. The area is devoid of vegetation except the scattered shrubs and bushes on the streams of Hagari that drain along the north-west and south-west of the site.

Chinnakonda

The site (15.054342 N and 77.179434 E) is situated to the south west of Vidapanakal village in a fortified hill locally called 'Chinnakonda'. The hill is located adjacent to Sri Satya Sai Baba water tank. The top of the hill with an altitude of 490 m above mean sea level (MSL) bears bruisings of bull, deer and a game board on the rock boulders in the remains of medieval fort. Each of the figures is found depicted on separate granite boulders that dot the hill. Besides, the vicinity also yielded ground polished stone axes made of dolerite. It is interesting to note that no pottery was evident from both the adjoining hills which hold remains of bruisings and stone tools. The same topographical and ecological settings are present here as at Peddakonda, except the latter being bigger in size. Thus, the area being rich in raw materials, vegetation and water source would have attracted the Neolithic communities.

Katamadevudu

The site (14.553846 N and 77.733089 E) is situated on a granite hill east of Sanjeevapuram village besides the Anantapur-Madanapalle highway road. The hill, named after the God '*Katamadevudu*' is also known locally as '*Katamayya*'. The

southwest of the foot hill retains traces of habitation deposit now lying in cultivated field and disturbed by digging (Plate-2). No artefacts were found from the habitation debris. But, a good number of polished stone tools and pottery of Neolithic period were collected from the slopes and foot of the hills. The top of the hill has several rock shelters where a solitary piece of burnished blotchy grey ware and several wares assignable to later period were collected. Besides, cupules or cup marks and an engraved footprint or cattle hoof are found on the flat rock surface. To the south of the hill adjacent to the foot path were noticed, bruisings on two huge granite boulders. The images were of three deer, where two deer facing south were depicted on the first rock boulder and a single deer facing northeast on the second boulder. The present site is located at an altitude of 510 m above mean sea level (MSL). The area is rugged and is studded with multiple intrusions of granite and dolerite dykes. The vegetation on the granite hill is mainly scrub jungle type of thorny bushes. The soil is predominantly red in colour. The site is very rich in the form of artefactual as well as in terms of religious importance. The local villagers worship the 'Hill' or '*Konda*' with a ritual of walking barefoot around the hill. The ritual is followed every year in the month of March for three consecutive days, seeking protection and prosperity.

Besides, the surface collection a good no of artefacts which includes stone tools, ceramic knobs and pottery of various wares in complete form were noticed from one of the personal collection, named Krishna Swamiya of Katamadevudu, village (Plate-4). Of the artefacts, the interesting ones are the spouted pot, red ware bowl with inscribed graffiti marks and a flat chisel tool. According to him, the collections were made some 10 years back from *'Kattmayya konda'*. The artefacts are kept in his personal 'shrine' and some pots were used for storing water. Thus, with systematic

work it is hoped to reveal more insights of the Neolithic and various cultures associated with the site.

Buthamahal

The site (14.957821 N and 77.225052 E) is situated southwest of Budagavi village and '*Budagavikonda*' about 0.5 km west of Anantapur-Bellary highway road. The present site with an altitude of 502 m above mean sea level (MSL) is a castellated granite hill with numerous rock shelters. The shelters are used by the locals and cattle herders for leisure and as resting place now. The foot of the hill and surroundings of the rock shelters yielded artefacts of burnished grey ware, coarse red ware, red impressed ware and stone tools. The northern foot of the hill retains thin deposit of habitation which now lies in a cultivated field. Since, most of the area is disturbed and eroded by the cultivation and the ongoing quarry, accurate dimension and thickness could not be calculated. The present site shares the same topographical and ecological settings with its adjoining '*Budagavikonda*' situated about 1 km on the northeast.

Narasanayakunikunta

It is a hamlet of Kodimi village located about 4 km from Anantapur on Bellary highway. The site (14.71927 N and 77.54814 E) lies at a distance of 0.5 km, southwest of the existing village in a low altitude valley. The altitude of the present site is 360m above mean sea level (MSL). The surrounding area is in a low relief plain covered with red soil. To the west of the site, at a distance of 1.50 km is the '*Kodimi Cheruvu'*. No artefacts were found from the site, except a solitary bruising 'circle with a trident' on a low boulder. The ashmound and habitation deposit as reported earlier could not be located in the present exploration.

Sites with Ashmounds

Karutlapalle

The site (14.71428 N and 77.37442 E) is located in Kudair taluk, of Anantapur district. The two ashmounds at this site are in open area lying in a cultivated field of red soil. They were located 0.5 km on the south-west of the existing village, adjacent to Kuderu-Atmakur road. The two mounds are aligned in north-east and south-west directions facing each other. The mound on the northern side is in much disturbed state due to cultivation and the trenches dug in and around the mound in recent times. Though precise dimensions could not be ascertained, effort was made to record the approximate area of the surviving mound, where it measures 2560.1 sq m. While the other in south is comparatively huge, roughly circular and undisturbed mound with ash lumps (Plate-3a), measuring 3198.8 sq m and about 3 m depth from the ground level. The vicinity of these mounds are noticed a large number of Neolithic implements, pottery and animal bones. The area with an altitude of 459 m above mean sea level (MSL) is an arid treeless tract underlain by dolerite dykes.

Rachepalle

The site (14.88349 N and 77.75416 E), with an altitude of 280m above mean sea level (MSL) is situated about 2 km south-west of the existing village in Singanamala taluk. It is an ashmound lying in an open area at the foot of the hillock locally known as '*Sitaramakonda*'. The topography of the area is predominantly rocky terrain. The dimension of the mound is about 400 sq m. The mound roughly circular is lying in the cultivated field of red soil and is partially disturbed. The exposed section of the mound yielded ground tools, sherds of burnished grey and grey wares. On the South-east of the mound, in the same vicinity was noticed about ten (10) megalithic burials with typical megalithic black and red wares found in the disturbed areas. The association of

megalithic wares along with the Neolithic assemblages suggests continuous occupation of the area by the proto-historic communities right form Neolithic to megalithic period. On the north of the mound drains the Pennar river at a distance of 1.5 km.

Malapuram

The village is on Uravakonda-Bellary road in Vidapanakal mandal. The site (15.03915 N and 77.19014 E), with an altitude of 485 m above mean sea level (MSL) is about 1 km south of the village. To the south is noticed an ashmound completely disturbed at the foot of the hill known as '*Veerabhadruni Konda'* near Anjaneya temple. This ashmound is only partially preserved owing to destruction largely by cultivation and the trenches being dug up in recent times. The mound spread in an area of 8413 sq m is about 2 m depth from the ground level as seen from the trenches dug by the local people. The surface collection from the surrounding mound includes ground stone tools, grey wares and slipped wares in black and red colour. Besides this, large amount of iron slag pieces were found from the surroundings of the mound. This suggests the presence of successive culture in the site. The overall topography is on a plain area covered by cultivated fields of red soil. The close proximity of Sri Satya Sai Baba water tank on the northwest within a distance of 1.5 km and the presence of a reservoir at the foot of the hill suggests that the region was well drained and provided with good source of water supply for the Neolithic communities as well in the past.

Palavoy

The site (14.50146 N and 77.17895 E) with an altitude of 557 m above mean sea level (MSL) is situated at the western foot of a steep granite hill known as '*Palavoykonda'* in Kalyandurg, mandal of the existing village. It lies at a distance of about 2 km south-

east of the village. The Kalyandurg-Dharmavaram road runs along the length of the hill in the north-south direction. To the east and west of the site at a distance of 15 km flows the Pennar and Hagari rivers. The area has an undulating topography with gentle slope filled with clusters of isolated granite hills and several natural springs on the plains as well as on top of the hills. It is surrounded by cultivated fields of red sandy soils and treeless tract of thorn bushes. The slope of the hill bears evidence of habitation deposits scattered along the hill and two ashmounds of unequal dimensions. The artefactual collection from the surface includes a good number of polished stone axes, celts, stone balls, along with potsherds of grey and red ware. Besides black on red ware and megalithic sherds were the other finds from the site. The two mounds situated at the western foot of the hill are in north-south direction. The mound on the north is least disturbed and slightly bigger than the other mound located in south. It is roughly circular to oval in plan measuring 5321 sq m. The height of the exposed deposits measures approximately 6 m from the ground level gradually rising towards the foot of the hill (Plate-3b). While the other mound in south smaller in dimension and in height measuring 3697 sq m is much disturbed. The area all round these mounds are under cultivated field which thus got disturbed due to continuous agricultural operations. The surrounding areas of the mounds are covered with cactus plants and thorn bushes of acacia. To the south-west of the ashmounds is noticed a perennial spring and a lake known locally as '*Butanpalli Cheruvu'* located at a distance of 1 km on the north-east of the hill. The present farmer of the surrounding area irrigates their land from the above water sources.

The ashmounds of Palavoy, was excavated in the year 1967,[46] by Rami Reddy. Based on the artefactual evidences collected from the surface and the stratified deposits, three cultural periods were designated as "Pre-Neolithic, Neolithic and Post-Neolithic. The late Neolithic level of C-14 dates, 1965 B.C., thus, puts the Neolithic culture in the region between 2400 and 1000 B.C."[47]

Andepalli

To the east of the village about 1km between two big granite hill known as '*Kodikonda* and *'Durgamkonda'* is noticed an ashmound. The ashmound site (14.36602 N and 77.23447 E) is located on the western foot hill of '*Durgamkonda'*. The mound is much intact except for the few trenches dug by the locals on the western side of the cultivated field. It is oval in plan with a dimension of approximately 15554 sq m and the height of the deposit varies from 4.4 m from the ground level. The artefacts are concentrated mainly on the northern and western foot of the hill yielding ground stone tools and a good number of potsherds belonging to Neolithic and megalithic wares, indicating a successive culture of the site. From the ashy deposits on the cultivated field, several wares were collected thus, it indicates that it could have been a habitation site earlier and now merged with the ground level due to cultivation. The site has an elevation of 568 m above mean sea level (MSL) which further elevates towards the granite hills. The terrain gently slopes towards the south-west of '*Kamdaduru Cheruvu'* about 1 km from the site. The streams of river Pennar flows through the Western side of the mound at a distance of 2 km. The soil coverage of the site varies from red to sandy loamy. The surrounding area is an arid treeless tract with

[46] V. Rami Reddy, *The Prehistoric and Protohistoric Cultures of Palavoy, South India: With Special Reference to the Ashmound Problem* (Hyderabad: The Government of Andhra Pradesh, 1976), 4.

[47] Ibid., 123.

sparse vegetation of thorn bushes. Besides, several natural cisterns that flow from the hills, as is evident today could have added advantage for the Neolithic communities during lean seasons. Thus, with the provided favourable ecological niches of the region, with no doubt the prehistoric communities choose the site for their habitat.

Vitlampalli

Vitlampalli has a unique distinction of being a habitation site and an ashmound juxtaposed to each other. The site (14.592889 N and 77.062380 E) is situated at a distance of 1 km south-west of the village at the foot of the hill called '*Thimmapakonda*' in Kalyandrug mandal. The eastern foot of the hill bears evidence of habitation deposits which run all along up to the southern part of the hill. The surface artefactual finds in and around the foot of the hill and the habitation deposit yielded polished stone axes, stone balls, and Neolithic pottery and megalithic wares. Besides, two circular structures arranged in boulders were noticed in the vicinity of the deposits. To the north of the hill is the mound, where a foot passage runs through from the middle, to the 'Sri Dona Thimmaraya Swamy' temple located on the hill. The mound is roughly oval in outline measuring 18367 sq m in dimension. The surface around the mound is tossed with megalithic wares and slag lumps. The surrounding area of the mound is covered with cactus and thorn shrubs. Below, the hill in a barren land a menhir was noticed. All these elements occurring together with Neolithic vestiges, indicates immediate succeeding settlement of the site. The surrounding area is of rocky terrain with high altitude of 538 m above mean sea level (MSL). It is thickly covered with thorn bushes of Acacia series and red sandy soil one of the worst soil type for cultivation. The Hagari river, flows on the east about 6 km from the site.

CHAPTER 3

Locational Analysis of the Neolithic Sites

Introduction

The location analysis or spatial analysis is an important approach for site evaluation and selection of a particular location by the prehistoric people. This provides an understanding of the location dynamics and the factors that conditioned the given location to be chosen as settlement. However, these preferences were guided not only by a single factor but by multiple factors. In order, to know the influence of such factors, a precise approach is needed to study the preferences in the selection of specific locations. The chapter proposes the method of Digital Elevation Model to analyse the topographical area in which the sites are located. As stated above, one of the objective of this study is to investigate the preferences in the selection of the location, the study seeks to arrive at an approach as to how and what factors influenced those preferences. To see if the precise location was a conscious choice by the Neolithic communities in the given terrain.

In order to evaluate the above objectives, two factors are determined for the purpose of the study. Both the factors are differentiated by the method used to obtain them. For convenience, each method is discussed separately. The first factor considered is the sites location and characteristics based on observation from the field survey and as such the location of 37 sites was analysed, which was already discussed in detail in the preceding chapter. This aims to provide a basic understanding of Neolithic sites location preferences in the wider landscape. The coordinates obtained from Garmin GPS

instrument for each site were used as the basic location input in Google Earth, to highlight the aspects of the Neolithic sites in the study area.

The factors undertaken were:

- Classification: this includes classification of sites into attributes such as habitation sites, ash-mound cum habitation and rock art sites.
- Landscape: refers to the part of the river basin where the site is located: Hagari -Upper Pennar divide, lower Hagari valley and Upper Pennar basin.
- Topographic attributes: the process of the given physical environment in which the sites are located: the position of each site in relation to its terrain, this factor makes the terrain analysis easy to understand as a whole.

Sites Classification

Of the thirty seven (37) sites analysed, habitation remains were noticed from twenty two (22) sites. Here, the terrain preferences were taken as one of the major indicator, which indicated the preferences level in choosing the location for settlement. Among the considered sites, thirteen (13) are located on foot hills, six (6) sites on plain terrain while only three (3) sites are located on top of the hill. The topographic attributes of the site location reveals the subsistence strategy, habitability conditions, accessibility and mobility. However, to evaluate the topographic impact factors of the given sites, Digital Elevation Model is employed for further investigation. The second attribute of ash-mounds are accounted from seven (7) sites which are located on the foot hill, while four (4) ash-mound cum habitation were noticed from Mudigallu, Palavoy, Andepalli and Vitlampalli, which are all located on the foot of the hills. The ash-mounds sites are distributed in the area between lower Hagari and Upper Pennar river basin. Further, the third attribute with rock art were evident from eight (8) sites. An interesting feature

noticed in preference of terrain is that majority of the rock art depiction sites were located at top of the hill, with the exception of two (2) sites on the foot hill and only one (1) site in plain terrain.

Table 1. Classification of Neolithic Site Types

Site classification	Terrain	Number of Sites
Habitation		
	Foot hill	13
	Plain	6
	Top hill	3
	Total	**22**
Ashmound cum habitation		
	Foot hill	7
	Total	**7**
Rock Art		
	Top hill	5
	Foot hill	2
	Plain	1
	Total	**8**

Landscape

Accessibility to water source is a major factor influencing the location of the prehistoric sites. As water is expected to offer a wide range of resources to be exploited, we can expect more sites in region with good water source. As mentioned earlier in the preceding chapter, though the region is deprived of perennial source, and the major river systems have their origin in Karnataka state, with its tributaries, it successfully carved out a number of wide valleys which in due course created a number of spring channels and small water ways, an important feature of the region. Based on this, an accessibility to water sources for the sites are attempted. Taking into account the landscape of the study area, all the 37 sites explored are found to be distributed on the Hagari and Upper Pennar

river basin (Map-1). Accordingly, the river basin was divided under three heads such as; Hagari-Upper divide; Upper Pennar basin and lower Hagari basin to see the distribution of sites under each basin.

Table 2. Distribution of Sites in the River Basin.

River Basin	Distance or Proximity (in Km)	Number of Sites
Hagari Upper Pennar Divide		
	1 - 5	2
	5 - 10	1
	10 - 15	4
	15 - 20	9
	Total	**16**
Upper Pennar Basin		
	1 - 5	3
	5 - 10	2
	10 - 15	5
	15 - 20	3
	Total	**13**
Lower Hagari Basin		
	1 - 5	3
	5 - 10	1
	10 - 15	2
	15 - 20	2
	Total	**8**

In order to evaluate the accessibility of the water basin, the shortest distance from the location of every site, to the nearest shoreline point of the water source was generated. On the whole, 16 sites have been identified in Hagari-Upper Pennar divide (Map-2), all these sites yielded a good number of Neolithic remains in the form of stone artefacts, pottery and rock art depictions. Out of the sixteen (16) sites, two (2) sites are found located within the proximity of 1-5 km of the Pennar river and one (1) site situated at a distance of 6 km of the Hagari river. While the rest of the sites are found located at a

distance of 10-20 km away from river source. The Upper-Pennar basin has a total of thirteen (13) sites (Map-3), distributed within a distance of 5-20 km away from the water source, with exception of three (3) sites located within the proximity of 1-5 km from the river basin. Of the river basin, the lower Hagari basin account the lowest with a total of only eight (8) sites (Map-4). The closest proximity varies from 1-5 km with evidence of three sites (3) while the other remaining sites are in the range of 5-20 km. The accessibility parameters to the water source, highlighted an interesting aspect regarding the location selection. The average values of sites located within 5-20 km are quite similar for all the three river basins considered, with the exception of only eight sites (8) located within the closest proximity of 1-5 km. Even these eight sites are located on the elevated land surfaces free from erosion and disposition. Considering the high values of sites located far away from the water source, the rationale for such selection could be of two factors; due to flooding of rivers during monsoons; difficulty to draw water from the large river for daily needs. The highlighted aspect of parameter proximity to water source reveals that the Neolithic communities of the study area does not show the preferences for settlement near the river course or the water source was not an indicator for their choice in location of sites. The reason for such preference seems to be that, they wanted to avoid flood plain. Further it also indicates their rain dependent agriculture.

Topography

The physical environment consists of "undulations, hill and valleys"[1] which are the parameters used in order to understand the terrain preferences of the Neolithic folk. The terrain is one of the main topographic attributes considered, and as such three parameters

[1] Uwaezuoke Ifeanyichukwu Christian et al., "Terrain analysis, for determining the best location for a swimming pool, in Waziri Umaru Federal Polytechnic Birnin Kebbi, Kebbi State" *Journal of Environmental Science, Toxicology and Food Technology* 9, no. 6 (2015): 16.

of terrain - the foot hill; the hill top and the plain are delineated for each sites based on the terrain data analysed through Google Earth. The sites location analysis reveals, twenty (20) sites located on the foot hill, eleven (11) sites on the plain terrain and six (6) sites on the top of the hills. The predominance of the foot hill sites as identified by the present parameters, propose a clear preference for foot hill occupation and this has been a recurring phenomenon of the Neolithic settlements of south India. The analysis indicates clearly how the Neolithic inhabitants of the study area favoured certain environmental features to suit their needs in choice of locations for settlements. The interpretation which best explain the selection is the availability of raw material for the tools and the security to the settlement provided by the elevated foot hill, which provides dominant view of their cultivated land as well as protection from other natural elements. The physiographical and geological features have strong influence in the selection of Neolithic settlements in the study is proved beyond any doubt. The preference to settle on the foot hills rather than in other spots, such as on the plain areas, which would have provided potential soil for cultivation could suggest the presence of favourable geological resources, in the form of granite hills which provide shelters for habitations as well as to utilise the trap dykes and dolerite to manufacture their tools. The tools were one of the chief artefacts and a part of the best technological innovation of the Neolithic people. The strongest indication to the preference for the available resources is represented by the presence of one hundred and twenty nine (129) ground stone tools, made of dolerite stone from the present survey, which of course would represent only a miniscule percentage of their total repository of the tools and equipment. An additional advantage to be mentioned is that the location on the hill slopes would minimize the amount of time and energy, to transport the manufactured tools and raw materials to the habitation sites. The manufacture of Neolithic tools is a tedious and slow process involving various stages like

prepigmentation, pecking, grinding and polishing. The last three steps consumes considerable time. The tasks can be carried out in bed rock or hilly region as the tools are ground in 'cup mark' grooves. If the factory site is away from the habitation, considerable time has to be spent away from the home. It also involves security issues, if they are away from the habitation. The second factor which guided the choice for settlement on foot hills were the natural habitat for cattle grazing and also protection of cattle and humans from natural calamities. The obvious interrelationship between cattle and choice of location is supported by the bone remains at Palavoy,[2] which revealed majority of bones belonged to cattle, thus indicating the practise of pastoralism. Evidence can also be seen from the rock art sites of the study area, focussed on cattle depiction.

The results of eleven (11) sites located on plain area reflect the relationship between vegetation and soils. The interrelationship between the two variables posed the question of whether the Neolithic people chose a location on the basis of the existing vegetation or the soil. Wright,[3] wrote that vegetation is a reliable guide to soil fertility and the suitability of cultivation depends on its potentiality. The archaeobotanical evidence on the cultivation has been obscure despite the abundant evidence of pastoralism and domestication of animals. The remains of food grains recovered like horse gram, ragi

[2] The only extensive excavated site from the study area, which brings to evidence the Neolithic culture dated to early phase of south Indian Neolithic culture. The ash mound site was excavated by Rami Reddy, in the year during 1965-66 and the radiocarbon date 1965 B.C placed the Neolithic culture of Palavoy, from 3rd millennium B.C to late second millennium B.C.

[3] Ernestene L. Green, "Location Analysis of Prehistoric Maya Sites in Northern British Honduras" *American Antiquity* 38, no. 6 (1973): 288.

green gram,[4] barley, hyacinth bean, vigna, pigeon pea and wild okra,[5] suggests prevalence of primary agriculture during the Neolithic period. The soil preferences suggest eight (8) sites on red sandy soil, and only three (3) sites on black soil. The best explanation to account for the presence of sites on the red sandy soils is suggested by Vishu Mittre, that the above recovered plant remain species, "Ragi and horse gram can be grown in all kinds of soils and in limited conditions of water supply."[6] The evidence of rubbers, pestles, grinders, stone ball possibly used in processing of food or pounding plants etc., also suggests important function of vegetal food processing. Besides, the evidence of cultivation, the other factor could be availability of large tracts of pastures for cattle grazing. Yet, another possible factor to link is the land covered by red soils, probably could be the sources of clay used for pottery making, though this proposition is not tested. This is based, on the potsherds evidence collected from the study area, where majority of the sherds in section reveals micaceous and gritty substances, properties of the red sandy soils.

The evidence from six (6) sites on the hill top zones can be related to the functionality. There has been direct relationship between sites located on high landscapes to hunting and habitability conditions. Of the sites, three (3) are habitation sites while three (3) are with evidence of rock art depictions. The habitations on the hill top as at Peddadandukonda, Enugavi and Velpumadugu are located at 30-35 m elevation from the ground level. Thus these are low hills. A good number of stone tools and pot sherds were

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[4] Vishnu Mittre and Savithri Ravi, "The Environment and Economy of the Neolithic Cultures of South India: Palaeobotanical Evidence," ed. A. Sundara, *Archaeology in Karnataka* (Mysore: Directorate of Archaeology & Musuems Mysore, 1990), 102.

[5] Dorian Q Fuller et al., "Southern Neolithic Cultivation Systems: A reconstruction based on Archaeobotanical evidence" *Society for South Asian Studies*, vol.17 (2001): 171.

[6] Vishnu Mittre and Savithri Ravi, "The Environment and Economy of the Neolithic Cultures of South India: Palaeobotanical Evidence," 102.

collected from the habitation deposits. Taking into account, the artefactual remains and the spread of deposits, suggests that these sites were long stay settlements and not camp sites. The evidence of flat terraces at the former sites, could be indication of terrace cultivation practise. Allchin, quotes at "Piklihal of the prevalence of such terrace cultivation. To, him this could have served the functions of habitation, cattle penning and cultivation, though it could be of primitive plant cultivation rather than agriculture, was practised."[7] The evidence of rock art depiction cum habitation remains at Enugavi and Velpumadugu may suggest that the natural granite rocks could have added advantage for shelter as well as for artistic activities. The rationale, for the selection of such location could be driven by many factors such as, availability of abundant granite rock boulders to depict the images, since granite was the most preferred rocks to sustain the paintings. The second factor, which cannot be overlooked is for hunting the game. The depiction at Budagavi rock shelter, of human motifs shown moving towards an animal with a shield like object, seems to demonstrate the style of hunting or chasing an animal. One possibility could be, this rugged terrain offers places to hide and protect the cattle from other wild animals. The account of "cattle raiding has been documented in ancient texts like the Rig Veda, evidenced in erection of 'hero stones' to commemorate individuals killed while protecting herds during raids."[8] Thus, choice of location was not random selection but were guided by conscious selection to fulfil their needs of subsistence and also the location could have given them a clear visibility to have command over the surrounding territory.

[7] F. R. Allchin, *Piklihal Excavations*, (Hyderabad: The Government of Andhra Pradesh, 1960), 130-132.

[8] Nicole Boivin, "Rock art and rock music: Petroglyphs of the South Indian Neolithic," *Antiquity,* no.78 (2004):45, https://www.cambridge.org/core/services/aop-cambridge.pdf.

Digital Elevation Model

A Digital Elevation Model (DEM), "also referred to as the Digital Terrain Model (DTM) is a digital representation of earth topographic surface that consists of varying elevation attributes of the terrain."[9] It simply refers to the "elevation data organized in the form of a matrix."[10] It is also called a "model"[11] because the advance computer technologies, can use such derived data to model and automatically analyse the topographic attributes to generate terrain data, minimizing the cost and time. The DEM "store points with known elevation of the terrain, so that DEM can be transformed into a *point* with three set of points (x, y, z), where x and y are plan coordinates, and z is the elevation."[12] This data from DEM, acts as the key indicator for physical landscape processes, terrain shape and classification for terrain analysis as a whole. The meaning of "terrain" is complex and means different things to analysts in different areas. Here the terrain model refers to the elevation data only. In spatial context, "classification are sets of individual observations on points or pixels, looks at their characteristics (attribute values) and attempts to group them into classes based on similarity."[13] However, there is no single diagnostic classification, "it can be based on a single attribute or simultaneously use multiple

[9] Deng Fendong et al., "Modelling Slope Field Uncertainity Derived from DEM in the Loess Plateau", in *Advances in Digital Terrain Analysis*, ed. Qiming Zhou et al. (Verlag Berlin Heidelberg: Springer, 2008), 323, PDF e-book.

[10] Zhilin Li, et al., *Digital terrain Modelling: Principles and Methodology* (Washington, D.C: CRC Press, 2005), 9, PDF e-book.

[11] Priyanka Das et al., "Digital Elevation Model is a Tool for Terrain Analysis: Implication and Interpretation with Reference to Kuya River Basin" *Journal of Engineering Science and Innovative Technology* 2, no.1 (2013):1, http://www.ijesit.com/Volume%202/Issue%201/IJESIT201301_38.pdf.

[12] Peter A. Shary, "Models of Topography," in *Advances in Digital Terrain Analysis*, ed. Qiming Zhou et al., 36.

[13] Josef Strobl, "Segmentation-based Terrain Classification," in *Advances in Digital Terrain Analysis*, ed. Qiming Zhou et al., 127.

attributes"[14] to identify the characteristics of a given spatial context. Considering, the above mentioned analytical techniques of DEM, the approach is taken with a focus to study the terrain parameters, to answer the chief question: what factors led to the preference for selection of location?

Archaeological Data and Methodology

One of the main intent of DEM is to study site's own location and characteristics, and as such the location of eleven (11) sites are selected as samples to apply the proposed method. Because of practical limitations, the method could not be followed for all the thirty seven (37) Neolithic sites of the study area. The process involved in the extraction of elevation is strenuous and time consuming, and as such the selection was limited only to eleven (11) sites. However, despite the small sample the location of the sites in the sample is unambiguous, therefore, it is not likely that the keeping out of other sites would bias the sample. The eleven (11) samples were not selected randomly, but rather biased towards spatial location from Upper Pennar divide, lower Hagari valley and Upper Pennar basin to study and correlate the location variable preferences. They are the sites of Andepalli, Vitlampalli, Palavoy, Peddakonda, Katamadevudu, Mudigallu, Velpumadugu, Chinnakonda, Hullikallu, Budagavi and Buthamahal respectively. In addition, importance was given to site preservation and to include the excavated sites to gather information about the dates of occupation. The spatial variation from the eleven (11) sample areas form the basis for the application of DEM for location analysis.

[14] Ibid.

Data Used

Two data's are employed for assessing the location of the selected samples: the data based on direct observation and elevation data extracted from Google earth. The first data comprises the georeferenced coordinates collected on the field using Garmin GPS during field survey. The second data is based on elevation obtained from Google Earth (2017). The elevation data set as obtained for each sample is used as reference points and later evaluated in DEM to locate the sites.

Methods

To understand the distribution pattern of the Neolithic sites in the study area, digital elevation models have been prepared for selected sites. Digital elevation rendering facilitates examination of the local topography in the required context.

For obtaining the digital elevation model, the elevation data (MSL) of the region was required. Since, high resolution readings are required, it was decided to collect the readings from the data available on the Google Earth images. Though, the elevation readings are displayed on the Google Earth images, they are not made available in table or text format. Hence, manual extraction of the readings was taken up. Elevation readings to the extent of 2 kilometres from the site in all directions were collected in grid format. After projecting to the required area, a grid of 2 centimetres printed on a transparent sheet is laid on the computer monitor screen. Thus a matrix of 45 x 45 square grid was used. The grids are numbered both in x (East – West) *and y* (North – South) axis. The projection of the image is adjusted in such a manner that, one centimetre represents 50 meters. The elevation readings were collected by placing the cursor at the 'node' of each square on the transparent sheet. A total of 2,025 elevation readings were collected for each site. Approximately, 24,300 elevation readings were collected for the

selected 12 sites. These readings were recorded into a spread sheet in Microsoft Excel programme containing three columns. The first column indicates the grid number in 'x' axis, the second column indicates grid number in 'y' axis and the third column contains the elevation reading. This spread sheet is processed in the Golden software's Surfer programme to prepare grid file. Once, the grid file is available, it can be used to generate 'wireframe' model of the terrain. This 'wireframe' rendering of the surface terrain model can be manipulated to view the terrain from any angle or direction.

DEM- Data Presentation

Eleven sites were selected as samples for DEM based studies to understand the site's location and its characteristics in detail. As mentioned earlier the sample is biased towards the spatial location that comprises the three landscape division of the study area. The reason was that it could give the idea to understand the factors that are involved in the selection of location of the sites. The table below summarizes, the site's own location characteristics and furthermore, a combination of variables as identified from each individual sample will be discussed in detail in the next section.

Table 3. Sites Location Characteristics of DEM

Site	Elevation	Topography	Landscape	Distance from water source (Km)	Classification
Andepalli	568	Foot hill	Lower Hagari	20	Habitation-ash mound
Vitlampalli	538	Foot hill	Lower Hagari	7	Habitation-ash mound
Palavoy	557	Foot hill	Lower Hagari	19	Habitation-ash mound
Peddakonda	545	Hill top	Hagari-Upper Pennar divide	3.5	Rock art
Katamadevudu	510	Foot hill	Upper Pennar	12	Habitation-rock art
Mudigallu	540	Foot hill	Lower Hagari	15	Habitation

Site	Elevation	Topography	Landscape	Distance from water source (Km)	Classification
Velpumadugu	505	Hill top	Hagari-Upper Pennar divide	17	Habitation
Chinnakonda	490	Hill top	Hagari-Upper Pennar divide	13	Rock art
Hullikallu	523	Foot hill	Lower Hagari	4.5	Habitation
Budagavi	475	Foot hill	Hagari-Upper Pennar divide	16	Habitation-rock art
Buthamahal	502	Foot hill	Hagari-Upper Pennar divide	19	Habitation

Digital Elevation Model Analysis of the Selected Samples

As revealed from the above data, topography or site location was selected as the dependent variable. The selected dependent variable reflect the compound character of the landform for the samples and express the potential factors that control the selection of the location. The topography variable revealed two different spatial locations: foot hill and hill top respectively. As is shown in Table-5, a comparison with other variables reveals an interesting aspect i.e., spatial dependency. Among the considered sites, eight (8) habitational sites are located on the foot hill (Fig.1-8), with the exception of only three (3) sites located on hill top (Fig.9-11), with evidence of rock art depictions. However, when comparing the site accessibility to water bodies, the average distance values were consistent for both the foot hill and hill top locations, wherein nine (9) sites are located within 7-20 km in Hagari-Upper Pennar divide and only two (2) sites in lower Hagari valley within less than 5 km from the river coast. This revelation obtained due to terrain analysis is important as it reveals the Neolithic folks non-preference for low elevation valley regions. The avoidance of locations adjacent to rivers could be due to, the threat of flood, difficulty in drawing water for everyday use. A better interpretation is the presence

of seasonal water source i.e., "*Cheruvu*" observed at varying distances between 1 km from site location at several sites of Velpumadugu, Peddakonda, Chinnakonda, Budagavi, Katamadevudu, Palavoy and Andepalli etc. These water system are still in use today, probably providing the source for domestic water use and irrigation purpose. As majority of the sites in question are near small water systems for daily necessity, the connection between location and water cannot be attributed to in the search for fresh water for daily use and thus, it can be observed that the river source was not an influencing factor while choosing the location for settlements.

The results, thus, indicate a strong association with the geological factors and spatial locations chosen for habitations. The best explanation, given the above data, is that these sites were situated in such specific locations to take advantage of the natural resources. The natural resources here could be identified as the easy availability of raw materials for manufacture of tools, accessibility to hunting area, adaptability conditions, availability of pastures for cattle and visibility to overview and control their territory. Further, most of the valley regions are covered by black or red soil. During rainy season, such region are prone to water logging and would be very slushy. Having habitations in such region causes lot of inconvenience to the habitants. On the other hand, the sloppy foot hills provide good drainage and have abundant mix of rock material, which makes the terrain more habitable and congenial. The focus on local resources can be explained by the archaeological data, evident in the form of ground stone tools. A good number of ground stone tools were obtained from the field study, accounting to 129 artefacts. The chief raw material used in the manufacture is the igneous variety of dolerites. The dolerites occur in the form of dykes in great size and length that dot the granitoid hills generally found as exposed veins on the hill crests. The above mentioned factor, also

indicate how the location helps in saving themselves the unnecessary labour and time to transport the raw material or the final product.

Taking into account, the results of classification variable (habitation cum ash-mound and rock art), which deal with site types reveals correlation between habitability conditions and site functions. In due part the topography or terrain characteristics seems to have been as important with the evidence of nine (9) habitation sites from the total samples. The habitation and ash-mound area measurements obtained using GPS in the field varies from 5281sq m to 18,367 sq m. The excavated site of Palavoy, revealed three cultural periods designated as "Pre-Neolithic, Neolithic and Post-Neolithic. The C-14 dates for the late Neolithic level 1965 B.C., thus, puts the Neolithic culture occupation of the site and the region between 2400 and 1000 B.C."[15] The dominance of habitation cum ash-mound amidst the foothill would have provided the proximity to resource exploitation. The Neolithic folk, as agro-pastoral community had to move about in their resource region and as such the location of habitations at preferable terrain would have added extra advantage. As mentioned earlier, the terrain they chose to settle, probably provided easy shelter and mobility from one location to another. Further, the plain land between the slopes could have been utilised for seasonal cultivation, which needed minimum effort in clearing the land. The probability could also be seen in the favourable orientation of the terrain to adopt strategies for collection of resources and strategic location for protection. The second variable with rock art sites is evident on the site of Peddakonda, Chinnakonda and Velpumadugu (Fig. 9-11). The last site is remarkable for having habitation cum rock art depictions. The mentioned site types reveals the influence of functionality in relation to its terrain surroundings in the decision. For example, a

[15] V. Rami Reddy, *The Prehistoric and Protohistoric Cultures of Palavoy, South India: With Special Reference to the Ashmound Problem* (Hyderabad: The Government of Andhra Pradesh, 1976), 4.

location suitable for habitation may not be suitable for other purpose like art execution. Thus, the location of the rock art sites was chosen depending on the requirements of the activities - in search for potential rock to depict the images.

Conclusion

To summarize, the use of DEM methodology on the selected sample for site location analysis enabled us to infer the locational preferences of the Neolithic folk. On the factors which guided the selection of the location, the data results demonstrated terrain preferences and availability of resources as the guiding factor on the decision making. These two factors are seen as the significant factors in deciding the location of the sites. An interesting aspect that is highlighted from the location analysis is that the proximity of water sources was not an influencing factor in the selection of the location for the Neolithic sites of the study area. However, the interpretations are not exhaustive and the propositions are suggested on the results of the selected samples only. In conclusion, the methodology adopted for the analysis of location preferences worked reasonably well with the selected samples and the factors determined for the study. The analysis does gives a basic understanding on the site location biased towards the topographic features like the elevated foot hills for habitational sites. The rocks, of the hill tops have presented the natural required surface for executing the art in the form of paintings and bruisings. As such sites with Neolithic art are located on the top of the hills. The aversion to plain land for settlements is adequately demonstrated by the terrain analysis. The analysis clearly showed that in a given landscape, where the hills, foot hill area and the plain land was available, the Neolithic folk preferred foot hill areas for habitational settlements (Map-5).

CHAPTER 4

Classification of Artefacts from Surface Collection

Introduction

Artefacts have long been an important aspect of archaeological information of past societies. For example, in the *Dictionary of Artefacts*, artefact is defined as "any object made, affected, used, or modified in some way by human beings"[1] which continued, to serve as an immense analytical and methodological importance in reconstructing the human behaviour of prehistoric communities by interpreting the artefact finds. These artefact remains, shaped and used by prehistoric man raises the question of 'what' are they, and 'how' they were used. To answer the question, it is necessary to adopt an approach to begin with. For, any artefact analysis the fore most attempt should be to identify and classify the assemblages to achieve the specific purpose. Chang, "has rightly observed, they are the backbone of prehistoric studies."[2] Adams and Adams, expand on this idea by stating that "typologies are tools made for a purpose and, as long as they can be shown to work for that purpose they require no more abstract justification. The validity lies ultimately in their value."[3] This definition works perfectly and is precisely the objective of this chapter. The chapter focusses on typological analyses of artefacts recovered in exploration from thirty seven (37) Neolithic sites of Hagari and

[1] Barbara Ann Kipfer, *Dictionary of Artefacts* (U.K: Blackwell, 2007), 17.

[2] William Y. Adams and Ernest W. Adams, *Archaeological Typology and Practical Reality: A Dialetical Approach to Artefact Classification and Sorting* (New York: Cambridge University Press, 1991), 8.

[3] Ibid.

Upper-Pennar region. The Neolithic artefacts of the study region is represented by ground stone tools and pottery of various wares.

The chapter is divided into two sections, which correspond with the approach taken. Also keeping in mind, as to deal the large artefact assemblages together and in the hope not to overlook the details, a detail description of each specimen is taken up. The descriptions are attached at the end of each section. Thus section-1 deals with the ground stone tools typo-technological analysis, which play a vital part and serve to exemplify many points that develop in Chapter-5, which tries to draw together the evidence and attempts to correlate the typological analysis of the stone tools and use wear analysis through microscopic method. The section-2 is concerned with the pottery collection to typological analysis.

Ground Stone Tools

The study done on the surface finds of one hundred and twenty nine (129) stone artefacts reveals the majority as ground tools. Only two (2) grinding stone, a stone hammer and a stone hopscotch have been found along with the ground tools. Based on Allchin classification,[4] the ground tools are further classified into two types: edge tools and non-edge tools. The edge tools are divided into the broad categories of axes, celts, adzes, chisels, chopping tools and non-edge tools include hammer stones, grinders, stone balls,[5] pestles and rubbers. The techniques: flaking, pecking and grinding; flaking,

[4] F. R. Allchin, *Piklihal Excavation* (Hyderabad: The Government of Andhra Pradesh, 1960), 85.

[5] The term used for '*sling stones'* as mentioned elsewhere.

pecking, grinding and polishing are the main criteria considered for the classification of typo technology. Along with the above two mentioned, though minimal, techniques such as only flaked, only pecked and complete ground are also found. As mentioned earlier, this section on stone tools is based entirely on typological classification. Such an analysis was performed in order to clarify the variability in the assemblages. In trying to study the stone tools it is very necessary to consider the vital factors of raw materials of stone implements to identify the morphological and technological stages.

Raw Material

The rocks used as raw material include igneous and metamorphic varieties for the manufacture of ground stone tools. The former range from varieties of granite, dolerites, basalt, diorites as well as amphibolite's[6] or amphibole (dark coloured stone in green, black or brown). The latter includes quartz and quartzite to varieties of micaceous schists and gneiss. The dolerites occur in the form of dykes in great size and length that dot the granitoid hills and other rocks generally found as exposed hills or as veins in the hills. In the whole series of igneous rocks, the cooling of molten rock might have resulted in the formation of joint planes, and in the selection of raw material this played an important part.[7] No doubt, the feature has been seen as a characteristic in few artefacts of the present collection, where little forming was needed for the final tool. Foote writes "the old stone workers were very keen on saving themselves unnecessary labour; and in order to do this they sought for specimens of the rough material which were so shaped

[6] V. Rami Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh* (Hyderabad: Government of Andhra Pradesh, 1978), 40.

[7] F. R. Allchin, "The Neolithic Stone Industry of the North Karnataka region," *Bullettin of the school of Oriental and African Studies,* vol. 19 (1957): 322.

by the existence of joint planes as to approximate to the forms they desired to produce".[8] An analysis of the material used in the manufacture of the tools as listed by Reddy given the preference for igneous rocks affirm the same for the present study. This accounts for 125 (96.89 %) tools of igneous rocks while the metamorphic comprise of only 4 (3.2 %) specimens respectively. In this classification group, dolerite constitute the largest with 96 (76.8%), granite 15 (12 %), olivine[9] 14 (11.2 %) specimens (Chart-1). This confirms to dolerite being primarily used for making all the Neolithic tools in the study region. The dolerite occurs frequently in manufacture of edge tools. This medium coarse grained seems to lend itself easily to flaking and hence widely used in the preparation of these tools. For grinders, pestles, rubbers and stone ball dolerite was used, but for stone balls granite and olivine are found more common.

Next in importance is the olivine (Allchin's and Foote's pistacite or pistacite granite, Reddy's epidote granite), which accounts to fourteen (14) stone balls in the present collection made of this material, thus confirming to earlier scholars observations. The olivine given various names was inferred in different theories. For instance, Foote indicates the fondness or love for the colour of stone by Neolithic and that they were brought from distant places, and Allchin, when found at Raichur district inferred it to be the evidence of trade, and a product of single factory traded throughout the area. Along these same lines of thought, the evidence of single tool i.e., stone ball made of olivine found in the study area cannot be ignored. Encyclopedia Britannica defines "Olivines are an important rock- forming mineral group, found most commonly in mafic and ultramafic igneous rocks."[10] Due to high content in magnesium (Mg),

[8] R. B. Foote, *Prehistoric and Protohistoric Antiquities of India* (Delhi: Leeladevi, 1916), 17.

[9] Rock minerals that occurs in igneous rocks, usually dark in colour.

[10] https://www.britannica.com/science/olivine, accessed on 10/07/2017.

olivine are unstable to weathering and when found as an altered material it should be present at or near the out crop area or the source rock.[11] In the absence of chemical weathering, they accumulate to produce green or greenish black sands. It seems reasonable to infer that they were single products of one industry that were manufactured from the parent igneous raw material, and not fetched from distant land. The probability and the mystery of nomenclature attached to it will be discussed in larger detail in later section.

Technology

The techniques employed in manufacture of tools depended upon the raw material of the rocks and the selection of stone piece. They were sometimes made from nodules of rock, but more usually from fragments of suitable rock.[12] This might have been done to reduce the amount of labour and time incurred in tool making. This have often been discussed by different scholars, with different stages and processes over the time. Allchin and Reddy postulated three stages such as flaking, pecking and grinding in the manufacture of a tool.[13] Of these, flaking maybe derived from the old stone age while pecking and grinding has been regarded as one of the hall marks of Neolithic,[14] wherein the former enabled a rough piece of stone into desired shaped and the latter for edge portion. This might have attained by rubbing against a coarse material and a little water serving as abrasive in the groove. The techniques of grinding and pecking has been discussed as a process that involves lengthy and costly techniques, where an example is

[11] Bruce Velde, et al., *Archaeological ceramic material: origin and utilization* (Berlin: Springer-Verlag, 1999), 23.

[12] F. R. Allchin, "The Neolithic Stone Industry of Northern Karnataka," 323.

[13] V. Rami, Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh,* 41.

[14] F. R. Allchin, "The Neolithic Stone Industry of Northern Karnataka,"326.

cited from an Australian aboriginal craftsman who took several minutes to shape a tool by flaking, while the pecking and grinding of the same specimen took a couple of days.[15] In considering the large number of tools found with both the techniques involved, emphasizing the craft aspects of the industry.

While Foote, Sankalia and Subbarao retained four-stage preparation of ground stone tools such as flaking, pecking, grinding and polishing, most often polishing is not regarded as a separate stage, and recognize only the first three stages. For instance, Reddy took both grinding and polishing under one category. Here, the term "polishing" refers to tools with distinguishing shining surfaces which reflect light and show limited grinding. To convey the meaning such tools are described best under the term "Ground Stone Tools."[16] For it is observed that not all the specimens carry all the described techniques in fashioning the tool. Consequently, rarely only few fully ground tools are found in any collection. The techniques were employed depending upon specific requirement. There are numerous instances, where tabular blocks in suitable size were converted into edge tool by simple grinding at the edge portion.[17] The techniques of flaking, pecking, grinding and polishing are the main criteria considered for the classification of typo technology. Though minimal, some tools were pecked and ground, flaked and ground and only flaked.

[15] Ibid.

[16] H. D. Sankalia, *Stone Age Tools: Their Techniques, Names and Probable Functions* (Poona: Deccan College, 1964), 82.

[17] A. Gosh*, An encyclopedia of Indian Archaeology* (New Delhi: Munshiram Manoharlal, 1989), 333.

Typological Classification of Ground Stone Tools

The classification of artefact is considered as an important "cornerstone of archaeological methodology,"[18] for any analysis. It facilitates in generating questions about the objects to be treated and in descriptive purpose. The classification of Neolithic ground stone tools was first studied by Foote. In his collection of antiquities, he recognized two artefact types ground and polished object and unpolished object[19] based on morphological analysis, wherein he divided the polished object into 40 groups and unpolished into 25 groups. Further, celts were divided into 12 types, chisels into 6 types and axe hammers into two types. Several other eminent scholars followed Foote footsteps, like Subbarao, who recognised 10 types in axes group. However, failed in his classification by the inclusion of axe hammer, adze and chisel in axe group.[20] Worman and Seshadri also failed in their attempt which contained a broad generalization.[21] Rami Reddy, classification on the Neolithic stone tools of the study region also had downside in classification of techniques. Among all, Allchin classification gave more emphasis and detailed aspect of the ground stone tools by classifying them into five major groups such as edge tool, points, rubbers and grinders, hammers and miscellaneous [22] which were further divided into sub-groups.

After considering all the classification that there is no definite and appropriate framework to cover the entire artefacts, the following classification is being applied for the present collection of ground stone tools. The stone artefacts collected from the

[18] William Andresfsky Jr., *Lithics: Approaches to Macroscopic Analysis,* second edition (U.K: Cambridge University Press, 2005), 61.

[19] R. Bruce Foote, *Prehistoric and Protohistoric Antiquities of India,* 20.

[20] V. Rami, Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh*, 45.

[21] F. R. Allchin, "The Neolithic Stone Industry of Northern Karnataka," 321.

[22] Ibid,.327.

surfaces i.e., a total of one hundred twenty nine (129) is classified on the basis of typo-technology into three categories viz. edge tools, non-edge tools and miscellaneous tools. The classification is based on Allchin typological division. The edge tools include axes, celts, adzes, chisels and chopping tools; non-edge tools such as hammers, grinders, rubbers and stone balls; miscellaneous tools includes marbles, dabbers or pounders and blanks. As mentioned earlier, each stone artefacts were treated with a detailed description of recording the raw material, and the morphology of the tool. The tools were subjected to metrical linear measurements using electronic digital calipers. The artefact maximum dimension of length, width and thickness were recorded in centimetres (cm). The weights of each artefact were measured using digital weighing scale to the nearest gram (gm). **Table 4,** shows the general metrical measurements and specifications of the total stone artefacts in the present collection.

Categories of Neolithic Stone Artefacts

The Neolithic stone artefacts are classified into two categories viz. edge tools and non-edge tools. Among the group, edge tools forms the majority with a total of sixty six (66) artefacts (51.17%), non-edge tools with a total of forty four (44) artefacts (34.11%) and nineteen (19) artefacts (14.72%) of miscellaneous group. Table 5 and Chart-2 shows the frequency and percentages of above two categories of tools and their sub-types collected from the surface of the explored sites.

Table 5. Categories and Percentage of Neolithic Stone Artefacts

Tool category	Tool types	Number and Percentage of Tools
Edge Tools		
	Axe	28
	Celt	13
	Miniature Celt	11
	Adze	8
	Chisel	6
	Total	**66 (51.17%)**
Non-Edge Tools		
	Stone Ball	34
	Flat Rubber	4
	Pestles	3
	Flat Grinders	2
	Hammer Stone	1
	Total	**44 (34.11%)**
Miscellaneous		
	Marble & Hopsoctch	5
	Dabber or Pounders	2
	Blanks	12
	Total	**19 (14.72%)**
Grand Total		**129 (100%)**

Edge Tools

Axes

There are twenty eight (28) axes, which form 21.7 % of the total collection (Plate-5). To ascertain the general shape of the tool both complete specimens and incomplete are taken into consideration. This was done with a detail description of each specimen and in the case of incomplete specimens, effort was made to bring out the detail as shown from the retained portion. This is to say that, half broken cutting edge and butt end in vice versa do reveal the supposed shape and the process involved in the manufacture. The longitudinal cross section analysis of the axes reveal lenticular or oval and flat sections. While most of the cutting edge had curvature and round profile. The largest

specimen weighs 778 grams, relatively thick and heavy implement, suggesting possible use for heavy duty tasks. All the axes are made on dolerite. Fig.12& 13 are examples of selected stone axes drawings. Based on typo-technology, the axes are classified as under:

Flaked, pecked, ground and polished
(A58, A67, A86, A96, A106, A113, A120, A130)

In total there are eight axes in the group. These are characterised by round and straight cutting edges. The polishing is found only on the broad cutting edge. Most of the cutting edge has flake scars and some blunted, suggesting its use for heavy duty work. The butt end pointed and conical shows no evidence of wear marks. This highly polished tools were regarded as rare and precious due to the lengthy process involved, probably intense rubbing over a smoother surface. The characteristic feature of a ground or polished axe is that it was hafted in such a way that the cutting edge was parallel to the handle. "Polished stone axe can with speed and ease split a casurina log over a foot in diameter. The thickness of the blade made it possible to strike the log very forcefully without getting it stuck in the wood. And even after such a use the blade was razor-keen".[23] The illustrated specimen A67, with smooth haft depression in the mid body suggests its use as axe with cross handle.

Flaked, pecked and ground
(A6, A35, A38, A64, A71, A73, A94, A132)

There are eight specimens in the group. The tools after attaining their initial shape by flaking were finished by pecking and grinding thoroughly. This gave smooth surfaces which give rise to lenticular and oval cross section. Cutting edge in preserved specimens are polished while the others reveal heavy flake scars which removed the actual cutting

[23] H. D. Sankalia, *Stone Age Tools: Their Techniques, Names and Probable Functions*, 84.

edge. The butt end shows battered marks. The wear marks suggests that the tools was probably put to heavy tasks.

Pecked, ground and polished
(A18, A20, A26, A59, A63)
Pecked and ground (A29)

On these axes no trace of flaking is observable. However, though no trace of it remains on the tool it may be presumed that the sides and edges of the axes must have been trimmed to some extent and evened out by applying flaking techniques. These type are characterised by fine pecking, grinding and polishing evenly smoothened on the surface. Cutting edge and upper portion are lost in most of the specimens, indicating its secondary use. The illustrated specimen A18, a well preserved polished axe in dolerite with flattish and accentuated curvature suggest wear markings of hafting to a handle. This probably hafted with a string holding on the other side was used for chopping. The pecked and ground type, shares the same technique with absence of polishing.

Flaked, ground and polished
(A49, A89)

These tools were initially shaped by flaking, and then ground and polished to have a smooth surfaces. The technique of pecking is absent. The illustrated specimen each are lenticular and flat in section.

Flaked and pecked
(A72)

The illustrated specimen reveal heavy flake removal at the initial preparation of the tool. The natural uneven surfaces and depressions of the body is evened out by technique called “pecking.” The tool is lenticular in cross section with the butt end well preserved with no wear marks.

Only flaked
(A34)

The tool is made of natural piece of dolerite stone. It is in the first stage of tool manufacturing, finely flaked and must have put to use without employing the further techniques.

Ground and polished
(A27)

No evidence of flaking or pecking marks visible on the specimen. This would have been apparently made on natural piece of a suitable size stone.

Completely ground
(A30)

The illustrated specimen is ground all over to a smooth surface. The smoothness on the surface and the intact polishing on the cutting edge might have obtained by intense rubbing. To obtain such smoothness must be a time consuming process and this might be the reason for its rare occurrence in the collection.

Celts

There are twenty four (24) celts which form 17.82 % of the total number of ground stone tools (Fig. 14). Generally natural piece of dolerite stone are utilised for making these tools. The tools retain original cortex on one surface or both in some specimens. The cross-section in mid body and bottom section are oval. Butt end is rounded and blunted due to battering, suggesting secondary use. Cutting edge is straight and has a balanced profile. In techniques, the celts share the same characteristics as with the axes described above. The technique in seven specimens are flaked, pecked, ground and polished, another seven with flaked, pecked and ground, four pecked, ground and polished, one flaked and pecked, one flaked and ground, one only pecked, one ground and polished

and one complete ground. In all cases, these celts are grounded and polished. As only pecked, flake and pecked though minimal are evident in two specimens. An illustrated specimen A25, a flatish celt with fine smoothness on the side interestingly suggest hand held use of the tool. A total of 11 celts from the entire collection reveal a distinct characteristics in terms of shape and its working edge put to use and has been classed or termed as miniature celts for the present study.

Miniature celts
(A122, A114, A75, A97, A121, A108, A119, A5, A107, A19, A36)

These are made on natural flakes of dolerite. The cross-section is generally rectangular but flat oval cross-section is also seen. The butt end is almost rounded with heavy battered marks, probably due to use. They range from about 5 to 9 cms. in length. The miniature celts have their own peculiarities. In techniques these are finely grounded and polished tool implements (Fig.15). Considering the delicate nature and the well preserved sharp cutting edge, the tools appear to have been used for domestic tasks. These miniature celts were considered by earlier scholars as rare and restricted to specific needs.[24] The significant occurrence of these miniature celts suggests the workmanship in executing and implementing the technology by the Neolithic people in this region.

Adzes

An adze according to Sankalia is "a carpenter tool meant for smoothening and bevelling irregular surfaces of wood. The cutting edge is transverse, that is, at the right angles to the handle, so that it can be hafted in a wood shaft."[25] There are eight (8) specimens, in

[24] V. Rami, Reddy, *A Study of the Neolithic Culture of South Western Andhra Pradesh,* 42-43.

[25] H. D. Sankalia, *Stone Age Tools*: *Their Techniques, Names and Probable Functions*, 84.

the present collection. These are made on natural piece of dolerite and has cortex on the surface. The cutting edges of these adzes are either straight or convex. In profile, two are plano-convex, three lenticular or ovaloid, two curved and one square in section. This accounts for their suitable use on wood and splitting operations. The biggest specimen, weighs 427 grams (A46), measures 13.55×5.45×3.48 cm while the smallest with a weight of 115 grams, measures 8.18×4.55×1.80 cm (A109). In two adzes the cutting edges are round or slightly convex. In technique, four adzes represent the four techniques of flaking, pecking, grinding and polishing, two adzes of flaked, pecked and ground, one adze only flaked, semi-finished with a large flake scars with absence of any working to smooth the tool. An interesting find in the collection is a specimen with grinding and polishing all over the body (A1). The surface is comparatively smoother on the steeper side, indicating its long use on material it was used. The above eight specimens are illustrated in detail in the section dealing with description of tools (Plate-6 & Fig. 16).

Chisels

These tools are small, narrow, cylindrical or rectangular pieces, a prototype of metal chisels[26] employed in wood working, essentially in carpentry. Foote is credited for the six fold classification, however he failed to make distinction between the picks with inclusion of his last variety with sharp point which actually belong to picks.[27] The collection of chisels consists of only six (6) specimens, highlighting their rare occurrence and the possible significance of the tool. Of the six specimens two are rectangular, two ovoid resembling almond and pear, one each cylindrical and elliptical.

[26] Ibid., 85.

[27] H.D. Sankalia, *The prehistory and Protohistory of India and Pakistan* (Poona: Deccan College, 1962), 529.

They vary in size between 13.18 and 5.75 cms in length, 5.71 and 1.70 cms in width and 3.17 and 1.70 cms in thickness. They are usually made on natural piece of dolerite stone and are ground implements. On the techniques from the specimens most of the chisels show evidence of grinding and polishing, except one with only flaking and no further working. The butt ends are thick and blunt with heavy battered marks while the cutting edges are straight and ground (Plate-6 & Fig. 16).

Non-edge Tools

The artefacts classified under non-edge tools category are Rubbers and grinders (4.65 %), Pestles (2.32 %), hammer stone (0.77 %) and stone ball (26.35 %). They form forty four specimens (34.20 %) of the entire collection. Although, this constitutes a minor part, their presence along with the Neolithic tools is significant so far as archaeological artefacts are concerned. The tools are treated equally as seen from the working and the techniques, wherever possible a detailed description on each is taken up.

Rubbers and Grinders

Under the category of 'muller class of implements are included the grinding stone, pestles, hammers, discoidal stones of uncertain purposes, etc.'[28] for the present collection rubbers are divided into flat and spheroidal types.

Flat Rubbers

There are four specimens in this type. These are made on flat natural slabs of dolerite stone, wherein the surface retains original cortex. There is no evidence of flaking, but are pecked all over to give the shape of a flat surface. The process of grinding involved or not in the manufacture is not known, however tentatively it can be assumed that the

[28] F. R. Allchin, "The Neolithic Stone Industry of Northern Karnataka," 333.

grinding evident on the body was attained by constant rubbing. The stones with flat section are 4.19 to 10.63 cms in length and 1.35 to 2.55 cms in thickness. Foote called them as 'mealing stones'[29] and were used in association with the quern. Both the surfaces are flattened and show that both sides been used. A solitary specimen shows the evidence of both the opposite sides on lateral axis being worked and utilised (A84). These tools are classified as domestic implements used for crushing or grinding work (Plate 9a). It is observed that they are in use in rural areas even today, though there is change in the type used. The same might have been practise by the Neolithic people with the use of natural piece of stone easily available in the vicinity.

Spheroid rubbers or stone ball

This type forms the largest with a collection of 34 specimens under the non-edge tools category (Plate-8). Foote was the first to use the term 'sling stones' and suggested its possible use for hunting,[30] but their use as sling stone cannot be ruled out, since the weight would require some strength. The term 'stone ball' is applied in the present study due to their shape, and it is because of their size and presence of grinding marks that they are grouped under rubbers, though the exact significance or method of use is not known. These rounded stone ball almost spherical in shape are made of olivine fourteen (14), granite twelve (12), dolerite six (6) and quartz two (2) material. An analysis of the raw material shows preference for olivine and granite as the chief rocks for making these stone balls. The sizes vary between 4.04 and 7.34 cms. The weight vary from 132 to 567 grams and is found to be consistent to Reddys 'sling ball' collections from south-western Andhra Pradesh. These rounded stone balls in majority show the characteristics of pecking and grinding. The tool seems to have been shaped initially by pecking. Most of

[29] Bruce Foote, *Prehistoric and Protohistoric Antiquities of India,* 20.

[30] Ibid., 21.

the balls have somewhat flat surface on either side, which lack rubbing marks. The other rounded areas has more rubbing evidence. The flat surfaces on the opposite sides are not uniform but unevenly distributed. The fine polished and smoothened surface is difficult to have been produced by pecking and grinding alone which indicates their use to extensive rubbing. The uneven depressions and large flake scar on the periphery might have resulted in course of their usage and constant battering. Based on the extent of use marks on the surfaces, it could be inferred that the tools were used for some kind of grinding or rubbing. This is supported by an example of A10 specimen, where only the rounded surfaces are subjected to grinding and flat surfaces are avoided. This indicates that, while the flat faces were held, the rounded surface was rubbed against some surface. The presence of significant use marks on the surfaces with battering and grinding, could be considered as domestic implements, employed in food processing. The other possibility is that they were used for dressing hides. These could perhaps be the reasons behind the significant occurrence of these tools, at all the Neolithic sites.

Pestles

There are three (3) specimens, one of dolerite and two of granite. These pestles are pecked and grounded. The vertical or longitudinal profile reveal triangular and rectangular cross section. They have smooth surface clearly indicating their use in grinding. The supposed pestles are broken either in one end or both in the present collection. One of the specimen with near ovaloid-rectangular section, strangely exhibits use marks at the shorter sides. The bruised sides of the tool suggest their use for dressing the animal hides or other similar specialised tasks (A127).

Flat Grinders

These constitute only a minor part with only two (2) in the total collection. These are flat stones made of dolerite and were ground. The flatter surfaces of both sides exhibits grinding marks, probably used for processing food.

Hammer

There is only one (1) specimen, a flat stone near oval in section in dolerite stone. It is pecked and ground all over. The lateral surface has evidence of battering marks, which suggest its probability as a hammer.

Miscellaneous

The stone objects which do not come under any of the categories described above, are listed here.

Marble and hopscotch

There are four (4) rounded stone balls. The raw material used are – two of calcareous stone and two of dolerite. These were pecked and the surface smoothened by grinding. Two balls weigh in 33 gm, another two 16 gm each and the last one 12 gm. Taking into consideration the weight of the objects, they seem to have been used probably as marble (?) for playing or as sling stones[31] for hunting because of their small size as suggested by Foote and Sankalia.[32] An interesting find is a flat natural stone in dolerite. The flake was trimmed on the edges to obtain roundness, resembling the shape of hop-scotch (?). Based on the above evidence we could infer, that the Neolithic people practised and gave importance to games and amusements (Plate-9c).

[31] Ibid., 21.

[32] H. D. Sankalia, *The Prehistory and Protohistory of India and Pakistan,* 530.

Dabbers

These are circular-bottomed, out flared disc with a central knob that joins the upper portion disc which is round and smaller than the bottom. Only two (2) stone dabbers are found (Plate-9b). They are made of dolerite. The dabber weighs 459 gm and 1270 gm respectively. The bottom is wider than the upper portion and is curved and smooth, having a diameter of 6.02 and 9.85 cms each. The rounded bottom areas have extensive pecking and chipping marks. A similar kind has been reported from the early historic site Paal, in Maharashtra[33] Tekkalakota[34] and Piklihal.[35] This could have been used by the potters to support the clay lump from inside the pot in pottery making which are known as 'pottery dabbers.' There is also the possibility of using this tool for domestic purposes like threshing of grains and pounding of various food items, as the chipping marks suggest.

Blanks and Flakes

There are eleven (11) examples of the former and one specimen of the latter (Plate-7 & 8). The former called 'blank' for the present study are usually those piece of suitable size stone selected for tool making. These are all in dolerite and majority of the blanks reveal only flaking with absence of other finishing techniques. There is clear evidence of original cortex on either one side of the blank or on both sides. It is observed from the specimens that, these blanks were the finest examples suggesting the stages involved in tool preparation. One of the specimen A60, shows a stage in the preparation of a tool, in which the blank has been achieved by a few flake scars without any further work.

[33] Ajit Kumar and M. Mahadevaiah, "Early Historic Artefacts from Paal, District Aurangabad, Maharashtra," *Puratattva,* no.45 (2015): 300.

[34] M. S. Nagaraja Rao and K.C Malhotra, *The Stone Age Dwellers of Tekkalakota* (Poona: Deccan College, 1965), 68.

[35] F. R. Allchin, *Piklihal Excavation,* 131.

Another noteworthy specimen in the collection A83, presumably suggest as to how the cutting edges were reduced by grinding and not flaking. The flaking might result in uneven breakage and could not attain the straight cutting edges they intend to get. Though, many of the blanks have not attained the final stage in the preparation of the required tool, they were used as hammers as is suggested by the battering marks on the ends and sometimes smoothening on the mid-body suggesting their hand held use as evident from specimen A14. It is also found that, some of the specimens were discarded when they no longer serve the purpose (example A93) due to breakage on the cutting edge. A dolerite flake with deliberate attempt in the manufacture of a tool is found in the collection. The exact purpose for the intended object is not clear, but two lines cutting each other in the middle on one side and a straight line on the other side suggest secondary working. Further, the occurrences of blanks and flakes suggest these are the by-product of flaking technique used for making ground stone tools.

Conclusion

The typological classification of ground stone tools reveals the distribution of raw material, and tool type's concentration. The dolerite of the igneous group is the chief raw material for the manufacture of the tools. The working techniques of flaking, pecking, grinding and polishing forms the significant traits of study. These techniques were employed either individually or in combination with one another. Based on typology, edge tools and non-edge types form the Neolithic stone tool categories. The type concentration shows the maximum utilization in edge tools, with axes being the most dominant type in the group. Majority of the edge tools reveal wear marks indicating its utilization and transformation of the tools in some cases. The hafting of axes and adzes also shows how the tools were put to working and utilization. This time consuming endeavour, in constructing the hafts and securely placing them, suggest their

multiple uses, maintained as needed and likely to be carried or transported from place to place over a span of time.

The evidence of non-edge tools like rubbers, pestles, grinders, stone balls and hammer stones point towards domestic activities, in processing food or pounding fibres or basketry. The presence of ground stone tools is a diagnostic trait of Neolithic tools. The edge ground tools, such as axes and adzes, are often viewed as characteristic of the Neolithic period, and has been an indirect evidence of the development of sedentary activities. The study of technological processes, typology of tools reveals the technical traditions and cognitive abilities of the Neolithic tool makers. The study also indicates that a good number of tools have been subjected to secondary use after their breakage. Out of a total of 129 tools in present collection, 21 tools constituting 16 % suggested secondary use. Thus economizing on the resource and the effort. However, though typological classification, is considered an important method for interpreting the data, the functions of the tools cannot be assumed merely based on typology. Hence, the evidence as inferred from the typological classification will be subjected to another level of the investigation to better understand the use of tools, in the following chapter.

DESCRIPTION OF THE TOOLS

AXES

A6. The top end portion of a shoe-last type celt, which has lost major portion of its lower body, made out of dolerite rock. Flaking, pecking and grinding evident on the piece. The sharpness of the top end suggests that it was not subjected to secondary tasks like pecking.

A18. A complete, well preserved polished axe in dolerite. The shoe-last celt has a well-proportioned body as dorsal and ventral surfaces as well as the side have symmetric proportions. The body has nicely worked pecking marks except the cutting edge, which is finely polished. Except for small visible flake damage on the cutting edge, the axe is complete and well preserved. One surface is more or less flattish, whereas the other surface has accentuated curvature. The upper half of the flat side also has wear markings of its hafting to a handle on the side. The absence of wear marks on the other side is suggestive of its hafting to handle on one side with the strings holding on the other side. This suggests that the tool was used more for chopping rather than dressing or peeling the surface.

A20. A broken axe specimen in dolerite. The lower body of the tool is completely lost. The top portion of the butt end is also broken. The preserved surface of the tool suggests pecking, grinding and polishing techniques in the manufacture of the tool. The broken portions have heavy flake scars suggestive of its final use against hard surface like rock material. Interestingly, alternate flaking is noticed on the edge side, though we cannot ascertain deliberate attempt to this alternate flaking. The body has evidence of deep calcareous patina on the surface.

A26. Stone axe in dolerite. The cutting edge of the axe is completely lost. It has rather flattish and wide body with pecking marks all over. The butt end is battered, probably

due to secondary use. The cutting edge has three big flake scars, which have removed completely the lower portion of the axe.

A27. Polished axe in dolerite. The axe, broken into half, has only the upper portion surviving. The tool is fabricated out of a natural piece of suitable size as suggested by the cortex on both the sides. The butt end is chipped off. No pecking marks noticed, but the body is ground and polished at certain places.

A29. Butt end portion of a stone axe in dolerite with pecking and grinding work evident. The surviving portion reveals round cross section. The upper portion of the butt is also lost due to flaking.

A30. A complete stone axe in dolerite. One surface of the axe still retains considerable cortex, while the other surface is evenly pecked and ground. The cutting edge is nicely polished and well intact. The freshness of the cutting edge suggests either its mint condition or its use with soft material. Except a small flake on the butt end, the tool is very well preserved. Longitudinally it has triangular profile while on transverse it is more or less oval.

A34. Semi-finished stone axe in dolerite. Most of the surface has flaking marks, but no pecking, grinding or polishing is evident. The tool is evidently unfinished.

A35. A perfectly made, elongated triangular axe in dolerite. The tool is very well preserved as both cutting edge and butt end are in pristine condition. The tool has a flattish profile with elongated oval cross section. Fake scars completely obliterated by extensive grinding. The cutting edge is perfectly shaped and well grounded, but lacks smooth polish. Very light chipping wear on the cutting edge suggests its engagement with softer material.

A38. A round sectioned stone axe in dolerite, broken at the cutting edge. Flaking, pecking, grinding and polishing evident on the body. The cutting edge is completely lost

as a major flake is noticed on one side with smaller flakes on the other sides. The finished tool seems to have been abandoned when its cutting edge is broken during its usage. The butt end shows battered marks suggesting its secondary use.

A49. A stone axe made out of dolerite. The upper body of the axe is roughly finished with huge flake scars. The tool has evidence of flaking, grinding and polishing in the manufacture. The cutting edge and the butt end have flake marks, which appear to be of recent breakage. The tool has near lenticular cross section.

A58. Polished stone axe in dolerite. The tool has prominent flake scars, which have not been evened out by pecking. The cutting edge of the tool is round and polished. The butt end is very pointed. The cutting edge has balanced profile from both sides. Most body has very thin patina, except a huge flake scar which seems to have been a recent breakage.

A59. A broken polished axe in dolerite. Both cutting edge and the butt end lost due to breakage or secondary use. Most part of the body has pecking and grinding with evidence of polishing at cutting edge. The cutting edge has huge flake removal and moderate batter marks indicative of the nature of its use during secondary usage. The butt end is blunted due to battering, probably this could have been used for pecking operations in tool manufacture.

A63. The bottom half of a polished stone axe in dolerite. Pecking, grinding and polishing are evident from the surviving portion. The cutting edge, slightly curved is well preserved except a small recent flake scar. The profile of the curvature is evenly balanced from both sides. The upper portion of the tool is broken off completely. The cutting edge is relatively fresh suggesting abandonment of the broken portion due to the breakage of the upper portion.

A64. Stone axe in dolerite. The axe has flattish thin body which is well proportioned. Flaking, pecking and grinding are evident from the body surface. The cutting edge is moderately blunted due to usage. The nature of small fakes indicate that the tool was used for light work, but not on too soft material. There is only one big flake mark on one side, which seems to have resulted in its abandonment, which also indicates the kind of finer work they intended or wanted to do with the tool.

A67. A polished stone axe in dolerite. The tool is quite heavy as it has thick section. Almost, the whole of the body has pecking marks, which have brought the tool to a balanced uniform shape. Polishing is evident on the cutting edge, but a major portion of it has flaked off. One side of the axe has four smaller flakes, while the other side has a heavy flake scar. The nature of flaking suggests its use for heavy duty work like cutting wood. The butt end is slightly blunted.

A71. A stone axe in dolerite. The tool was shaped by heavy flake removal, which has only been partially evened out by pecking. The tool has lenticular cross section at the mid body. The cutting edge is well polished and preserved. The butt end is slightly blunted by pecking. The lack of flaking and the overall smoothness of the body suggest that the tool was probably employed in the hand grip, likely for cutting softer material like leather.

A72. A polished axe in dolerite. The tool is quite heavy and has lenticular cross section. The tool prepared by heavy flake removal, has most of the body evened out by pecking. Further only on one side the cortex survives in a digression. The tool was either not used much or was subjected to lighter tasks on softer material, as much of the cutting edge survives without any blunting or breakage. The butt end also survives in original shape.

A73. A polished stone axe in dolerite. The tool has oval cross section, and most of the body is either finished with either pecking or grinding. The actual cutting edge has not

survived as one side has a heavy flake which has almost removed the polished section of the cutting edge. The butt end is blunted and the tool seems to have been employed for heavy tasks like cutting wood.

A86. A polished stone axe in dolerite. The tool was prepared out of a flattish flake having cortex on one surface. The use of extensive flaking to shape the tool is evident, but there is no evidence of pecking. The surface was evened out by grinding and polishing with deep flake scars visible. The cutting edge is roundish and has flaking removed at two places, suggesting its use on harder material like wood.

A89. A stone axe in dolerite. The tool has flattish surface and is thin in section. The tool was shaped by flaking mostly on the sides and then ground and polished. The cutting edge is straight but has slight curvature. Probably this tool was used for domestic purpose.

A94. A broken ground tool in dolerite, which has been flaked extensively on the cutting side probably with a view to reshape the axe. There is evidence of flaking, pecking and grinding on the preserved part of the body. The tool appears rough and coarse due to the absence of polishing and content of high feldspar. The butt end also has deep flake scars suggesting its secondary use.

A96. Lower half of a broken polished axe in dolerite. The preserved body shows flaking, pecking, grinding and polishing. The cutting edge damaged due to heavy flaking. The cutting edge reduced uniformly from both sides, suggesting its suitability as an axe. The mid-section is ovaloid in shape.

A106. A stone axe in dolerite. The complete tool has well-proportioned body, which has evidence of flaking, pecking, grinding and polishing. Longitudinally the axe has lenticular cross section which is well balanced on both sides, giving it a well-

proportioned appearance. The cutting edge is well polished, sharp and has slight curvature. The pointed butt end is also well preserved.

A113. A broken axe in dolerite. Both the butt end and cutting edge considerably flaked off. Flaking, pecking, grinding and polishing are evident. The tool might have been used for heavy duty tasks.

A120. A stone axe in dolerite. The tool was prepared by flaking, pecking, grinding and polishing. The cutting edge is straight and has a number of minor flake scars and moderate blunting of the cutting edge, probably suggesting its usage in heavy duty work like cutting the trees or wood. The conical butt end has no wear marks.

A130. Lower portion of a polished stone axe in dolerite. The upper portion of the axe is completely broken. The preserved portion reveals flaking, pecking, grinding and polishing. The cutting edge is blunted and also chipped off at places.

A132. A mid portion of a broken axe in dolerite. Both the cutting edge and the butt are lost. The stone has somewhat triangular section. The existing portion was finished by pecking and grinding.

CELTS

A3. A broken cutting edge of a celt made on dolerite. The upper section reveals lenticular or biconvex cross section. The cutting edge is reduced from both the sides. Most of the cutting edge is flaked, which suggests its extensive use on harder materials like wood.

A4. The upper half portion of a shoe last celt in dolerite. The surface reveals traces of intense pecking, though grinding is minimal, as the grounded cutting edge side is now lost. Now the top end looks like a stud as that position seems to have been put to use in course of time. The lower side, which is broken, reveals an ovaloid section, suggesting its reduction from all sides.

A5. A miniature celt fashioned in dolerite. It has a parallel sided body with slight inward lean towards the top with elongated ovaloid section. The extreme top of the celt is broken. The cutting edge is blunted due to usage and there is a deep flake scar on one side, suggesting that the tool was subjected to some heavy tasks, likely that it was used for carpentry work rather than some light domestic work. The techniques of pecking, grinding and polishing are evident on the body.

A13. Broken piece of butt end of a celt made out of dolerite. The lower portion of the celt in section is almost perfect oval in shape. Flaking, pecking and grinding are evident on the surface.

A15. A lower portion of a broken celt in dolerite, with butt end missing. The techniques of pecking, grinding and polishing are evident on the surface. One side of the cutting edge has accented slant suggesting its probable use in wood work. The broken piece seems to have been subjected to secondary use in the form of hammer as one side has predominant batter marks, and also much of the surface has big flake scars.

A19. Small sized celt in dolerite. The tool has flaking, grinding and polishing evidence, devoid of pecking, which has left the tool still with the flaking marks visible on the surface. The cutting edge is very smoothly polished, but has extensive wear marks as a number of small flakes have come off from the edge. The butt end is blunted, evidently because of constant battering by another instrument. The size of the chipping marks on the cutting edge suggests that the tool was subjected to use on wood. The surface has calcareous patination suggestive of its burial for a long time, probably in an ash mound. It may be noted that the site has evidence of an ash mound.

A22. A celt made out of dolerite. Only flaking and grinding are visible on the surface and grinding of the cutting edge evident. Major portion of the body still has pristine

flake marks. The tool doesn't seem to have been used much as wear marks are not extensive except a small flake off at cutting edge. The butt also has no wear evidence.

A23. A highly damaged celt in dolerite. The body has flaking, pecking and grinding evidence. The cutting edge is completely lost and now retain big flake scars. The butt end is blunted due to battering, probably suggestive of secondary use as pecking tool. The mid body section of the tool has oval profile.

A25. Butt end portion of a flattish celt in dolerite. The cutting edge is completely lost as only the upper half of the tool is preserved. The tool seems to have been prepared from a flattish natural stone, as flaking is evident only on the sides. Lack of wear marks on the flatter side and fine smoothness on the side suggests hand held use of the tool.

A36. A small pear shaped flattish celt in dolerite. The celt made out of a flake reveals grinding and polishing only, without pecking. The cutting edge is roundish and well preserved. Occasional miniature flaking on the edge suggests its use with softer material.

A45. A broken cutting edge of a celt in dolerite. The tool is prepared out of a flake which still retains some cortex on one surface. The techniques of flaking, grinding and polishing are evident. The light cutting edge suggests its light duty usage.

A61. A polished stone celt in dolerite. Flaking, pecking, grinding and polishing are evident. The well preserved cutting edge has balanced profile and is highly polished. Most part of the tool body is considerably patinated with calcareous deposit.

A62. A triangular polished celt made of dolerite. The longitudinal and transverse profile of the tool is well balanced. Most part of the body is evenly smoothened out except few flake indents at places. Due to high feldspar content in the raw material, the body though well grounded, has coarse surface. The cutting edge is straight and well preserved.

A75. A small stone celt in dolerite. The tool has flattish body. The technique of flaking, pecking, grinding and polishing are evident in the manufacture of the tool. The flake scars on the butt end side is smoothened by pecking. The cutting edge though blunted is smoothly polished and has small flake scars. The butt end is well reserved.

A87. A broken celt piece in squarish shape, probably used as a ‘rubber’ as one of the flatter surfaces is smoothened due to rubbing. This suggests secondary use of broken tools.

A95. The lower half of a broken polished celt in dolerite. The tool is fashioned from a natural piece, which has extensive cortex on one side. The extensive pecking is evident in the area of the cortex surface as well. Grinding and polishing was done at cutting edge portion. The sharp and slightly curved cutting edge is well preserved. The edge is reduced almost equally from both sides, giving it a rounded appearance. The butt end is broken from the mid body. The tool has near oval section.

A97. A polished stone celt in dolerite. The celt has elongated triangular shape and is highly polished, smooth and straight at cutting edge. The flattish body has flaking, pecking, grinding and polish marks. The delicate nature combined with the well preserved cutting edge suggests lighter tasks like domestic chores.

A107. A stone celt in dolerite fashioned out of a thin flake. The celt is near rectangular except the butt end which is slightly narrowed. Pecking is evident only on the sides. The flatter surface is finished by grinding and polishing. The cutting edge is straight and sharp with a small fake removed. The tool might have been use for domestic work.

A108. A small, thin celt in dolerite. The near rectangular celt was made out of a thin flake. Only grinding and polishing is evident. The cutting edge is straight and sharp. The elevated portions of the body has silky smooth surface, probably due to constant hand

held use. Considering the undamaged sharp cutting edge, the tool appears to have been used for domestic task.

A112. The mid portion of a broken celt in dolerite. Both the butt end and the cutting edge are completely lost due to breakage. Flaking, pecking, grinding and polishing are evident.

A114. A near rectangular celt in dolerite. The tool was made out of a thin flake. Flaking, grinding and polishing are evident. The butt end was rounded and reduced thinner. Though some polish is evident on cutting edge side, the edge is not sharp and on the other hand much blunted probably due to constant battering.

A119. A stone celt in dolerite. The tool appears to be semi-finished. Both sides of the broader surfaces have thick patination. The lateral sides show clear battering marks, suggesting its usage as a hammer.

A121. A small stone celt in dolerite. The elongated, near rectangular tool was made out of a thin flake. The cutting edge is straight, butt broken off on one corner. The entire surface of the tool is smoothly polished. The flakes removed on cutting edge suggest its use against harder surfaces. The butt end is rounded and was also sharpened, but lacks any battering marks. The tool appears like an artisan tool.

A122. A small stone celt in dolerite. The tool is made out of a small flake, which has flatter surface on one face. The opposite face is slightly curved. The lateral sides are grounded flat, but taper towards the butt end. The cutting edge was grounded sharp, but has small flake scars suggesting its use on softer material. The butt end is rounded and has a flake scar and also evidence of battering.

ADZE

A1. Parallel sided ground adze in dolerite, the upper half broken. The surface is discoloured due to superficial patination and is ovaloid in section. One side is flattish,

while the other side a steep cutting edge was developed by steeply reducing the edge at the end. The parallel sides and the thick body measuring (42.36 mm) suggests the intended strength for the tool. Thus, the tool appears to be a carpentry tool. Comparatively smoother surface on the steeper side also indicates its wearing on soft material probably soft plant and wet wood. The cutting edge has two deep flake marks on either side, suggesting breakage during its use.

A16. An adze fashioned out of a natural piece of dolerite which is already of suitable shape and size. Major portion of the tool has thick yellowish brown cortex. Flaking is evident only on one side of the tool. The cutting edge is obtained by grinding on one side, which resulted in near plano-convex profile, suitable for working on wood and splitting operations.

A21. This is a semi-finished adze in dolerite. The tool was designed to have very wide cutting edge as the slant on either side is steep towards the butt end. The tool has large flake scars, which have not been further smoothened by any working. The tool has accentuated curve when viewed in profile. The curvature clearly suggests its deigned use for wood dressing. Though the body is well preserved, the tool is evidently semi-finished only.

A40. Near parallel sided adze in dolerite. One surface is flat while the other is lenticular in transverse profile. Most surfaces are smoothened out with absence of flaking and pecking marks. The cutting edge is roundish and slightly worked out. The butt end has big flake scars suggesting its breakage during use. Interestingly, while the cutting edge is still well preserved, the butt end has extensive flaking. This may suggest hammering on the butt end. The surface of the tool has a thin coating of calcareous formation.

A46. Stone adze in dolerite. The body of the tool has slight curvature laterally with mid body having oval cross section. The technique of manufacture of the tool involved

flaking, pecking, grinding and polishing. Both cutting edge as well as the butt end chipped off in the recent past as the breakages looks fresh without any patina.

A74. A polished stone adze in dolerite. The tool is prepared out of a near squarish natural piece of stone, which has considerable cortex on three flat sides. The cutting edge is obtained by reducing the material on one side by pecking and extensive grinding or polishing into a roundish sloppy edge. The butt end is considerably broken with two heavy flake scars on the sides. The Extensive sloppy edge on one side suggests that the tool was used for dressing wood.

A82. A stone adze in dolerite. The tool was manufactured out of a suitably sized natural piece, which has been trimmed at places to get the final shape. While one surface is flattish, the opposite side has curved body. Pecking is minimal but the cutting edge is well polished and preserved. The curvature of the body suggests that the tool was used for dressing wood.

A109. An adze in dolerite. The almond shaped tool was fashioned out of a flake having a Plano- convex cross section. Flaking, pecking, grinding and polishing are evident. The flatter side of the tool is smoother as there was attempt to make that side flatter. The slanting cutting edge on the convex side makes the tool more suitable for dressing the wood. The excessively rounded cutting edge also suggests its suitability as an adze.

CHISELS

A7. The chisel in dolerite seems to have been made out of an existing flake of suitable size, which has been trimmed to size by further flaking. Overall the tool assumes an almond shape as the sides are inwardly curved. Pecking, grinding and edge polishing is visible. The cutting edge is slightly blunted due to its usage, probably in wood working. One side of the edge and butt end have evidence of battering marks. The predominant

slant on one surface of the cutting edge suggests its intended use for wood working, possibly in trimming the uneven surface of the wood.

A66. A stone chisel in dolerite. The technique of flaking, pecking, grinding and polishing is evident. Laterally the body of the tool has a slight curvature. The cutting edge is ground and polished well, and has minute flake offs except a major flake on a side. The butt end is blunted, apparently due to soft hammering by wood in course of its use as a chisel for carving wood or similar material. The overall evidence predominantly suggests its use as a chisel.

A68. A polished stone chisel in dolerite. The tool has almost round section and cylindrical body, which tapers only towards the butt end, which is rounded and blunted due to use. The cutting edge is almost completely chipped off with heavy flake scars, suggesting its use for heavy tasks. The tool has thick whitish patina which supports the presence of ash-mound site. The colour of the stone has turned slightly brownish, probably due to heat as can be assumed.

A88. A stone chisel in dolerite. The tool has very flattish surface on one side and a much curved body on the other. The cutting edge is very straight and the butt end tapered extensively, giving the tool a pear shape. The butt end is blunted due to hammering while working the tool.

A99. A long rectangular shaped stone in dolerite having patina on all sides except the cutting side which has a flat broken surface without any wear marks. No working is evident on most of the body except on one side of the butt end which bears evidence of polishing. The butt side which is roundish is blunted, probably by hammering with soft hammer. The purpose for which the tool was used is not very clear or can be ascertained.

A100. A long rectangular stone piece with one rounded end. Flake scars are noticed on one side, but there is no further working. The rounded end has evidence of battering with soft hammer.

STONE BALLS

A8. A round stone ball in granite, which is broken into half and further breakage on the remaining portion. The primary purpose of these tools is not known, but this piece seems to have been put to secondary use, as the flatter side of the piece has some evidence of grinding.

A10. Round stone ball in olivine, with three natural flat surfaces, primarily shaped by flaking and pecking and later subjected to use for grinding of some material. Interesting to note that only the rounded surfaces are subjected to grinding and the flat surfaces are avoided.

A11. Round granite stone ball with pecking marks. The surface is rough and coarse as the tool has not been subjected to grinding. It is also likely that the tool was used as a hammer stone by craftsman.

A12. Round stone ball with uneven flattish faces on five sides in olivine. The surface is evened by grinding.

A24. A round stone ball in dolerite. The ball is almost spherical with two flat surfaces on the sides. The surface of the ball seems to have been levelled by pecking. The surfaces appears to have been smoothened due to constant rubbing against some smoother object.

A31. Round stone ball in dolerite. The ball has flattish surface on two opposite sides. One of the surfaces is very finely polished while the other side also has polish, but still the flake marks leave uneven surface. The whole of the wider circumference is pecked

effectively without the flake marks. The polished side suggests that the tool was subjected to extensive rubbing.

A32. A round ball in quartz. Two opposite sides of the ball are flattish. Heavy calcareous patina is noticed on one flattish side. The opposite side still has flaking marks and is uneven, though impact smoothening is evident. The wider circumference of the tool is nicely pecked and grounded.

A33. Round ball made of pink granite. Though the tool is roundish, still three of the surfaces are flattish. Most of the surface is pecked well and moderately grounded.

A41. Round stone ball in grey granite. Most of the surface is rounded off, except occasional flake marks. The tool seems to have been shaped initially by pecking and then used for some form of grinding or rubbing.

A42. Round stone ball in granite. The surface is rounded off, except for some occasional flake marks. The tool seems to have been shaped initially by pecking and then used for some form of grinding or rubbing.

A43. Round stone ball in granite. Two opposite surfaces are flatter than the rest of the body. Initial shaping by pecking is evident. The even smoothening on the rounded portions suggests its use for grinding or rubbing.

A47. A rounded stone ball in granite. The ball has two flattish surfaces which are not worn out and rough on touch. The rest of the body smoothened by extensive rubbing. The cortex noticed at places and light coloured olivine fused on one side.

A48. Round stone ball in granite. Most surface pecked and then smoothened due to rubbing.

A51. Round stone ball in olivine. The ball has two prominent flat surfaces on opposite sides, and another unworn flat surface on rounded perimeter. The flat surfaces have only flaked marks, whereas the rounded surface was first pecked and then grounded.

A52. Almost perfect round stone ball in granite. Two opposite sides are silky smooth, probably due to constant handling. The rest of the body is pecked extensively and grounded moderately.

A53. A rounded stone ball in quartz. It has two prominent flat sides, one of which still retains extensive cortex on the surface. The tool is unevenly rounded and the rounded perimeter also has two flat areas. Overall the ball is unevenly rounded, but still two flat surfaces are evident.

A54. A rounded olivine stone ball with two prominent flat surfaces on opposite sides. The flat surfaces are so dominant that the stone assumes almost disc like appearance. The rounded areas have extensive pecking and grinding marks.

A55. A rounded stone ball in granite with quartz appendage. Only the bottom surface is completely rounded with silky smooth surface, while the opposite side is flattish and not worked. On the periphery four sides are flattish and unworked.

A65. A rounded stone ball in olivine. The ball is not perfectly rounded as still flatter surfaces persist on sides. Grinding is evident on all sides except two opposite flatter surfaces.

A70. A stone ball in greenish olivine. The two sides of the ball are very flat, and the other sides are rounded due to battering and rubbing. Still a lot more flat unworked surfaces on all sides survive on the tool.

A78. A rounded stone ball in olivine. The body has evidence of pecking and grinding and the ball is slightly bulged on the sides.

A101. A rounded stone ball in olivine. The stone has flatter surface on six sides. The edges of all these flatter surfaces are rounded, apparently due to rubbing.

A102. A rounded stone ball in dolerite. The overall body is rounded due to rubbing. Flake scar are seen at places, which have not been evened out.

A103. Rounded stone ball in greenish olivine. The stone was rounded due to rubbing on some surface. The stone still has four, unevenly spaced flatter surfaces.

A104. Rounded ball in granite. At places the surface has deep flake scars and also one of the surface has a large flake off. The rounded areas appear to have been evened by pecking and later due to rubbing the rounded area have become moderately smoothened.

A110. A rounded ball in greenish olivine. The rounded ball has flatter surfaces at places. The tool appears to have been finished by pecking, which is smoothened to some extent due to rubbing. There is a large flake removed on one side, probably broken during its usage.

A111. A rounded stone ball in greenish olivine. The surface seems to have been finished by pecking, which is evened out considerably into smooth surface due rubbing. There is large flake removed on one surface, but the tool continued to be used as the edges of the flake scar are rounded.

A115. A rounded stone ball in olivine. The ball has two prominent flat surfaces on opposite sides. On the rounded periphery six flat, undressed surfaces are present. It appears that the stone was first dressed to the required shape and size and in course of its usage the 'rounding' has occurred due to battering and rubbing.

A116. A rounded stone ball in dolerite. Two opposite areas have flattened surfaces. On the rounded periphery uneven depressions are noticed at three places. The rounded periphery was first evened out by pecking and due to later pecking the surface got smoothened.

A117. A rounded stone ball in granite. Two opposite areas of the ball are flattish. Except at one place most of the rounded periphery is evened out by pecking and later grinding.

A118. A rounded stone ball in dolerite. This ball doesn't have the usual flatter surfaces on opposite sides. Most surface of the ball was subjected to pecking and grinding.

A123. A rounded stone ball in olivine. The ball has two flatter surfaces on opposite sides. The rounded periphery is very uneven and roughly finished. Much of the rounded periphery seems to be unfinished.

A124. A rounded stone ball in olivine. The ball has two flatter surfaces on opposite sides. Except at two places, most of the other periphery is rounded by rubbing.

A131. A rounded stone in dolerite. The stone is overtly flattish, giving it a discular appearance. One portion of the flatter surface is very smooth suggesting its use as a rubber.

FLAT RUBBERS

A80. 'Rubber' stone in dolerite. A flat natural stone used as a 'rubber', probably used in pottery making.

A84. A stone 'rubber' in dolerite. A natural conical piece without further working. Both the opposite sides on lateral axis have very smooth surface suggesting its use as a polisher or rubber.

A125. A flattish stone in dolerite. One of the flatter surfaces is silky smooth which could have been obtained due to rubbing. Except the smooth part, most part of the body retains the original cortex. There is a deep straight line measuring about one centimetre on the polished side located at the outer periphery. It can be assumed that the tool might have served as a rubber stone.

A129. Portion of a rubber stone in dolerite. Both surfaces of this flattish stone are smoothened due to rubbing. The periphery of the stone reveals pecking marks.

PESTLES

A2. A broken piece of dolerite with triangular section having highly polished surface on one side. The piece was probably broken from a bigger grinding tool or pestle. Except

for the polished surface, the surface on the other side does not retain the original surface as breakage is obvious.

A127. A grinding pestle (?) in pink granite. The stone is broken in one end. The remaining portion shows ovaloid- rectangular cross section. The whole body has pecking marks, while the shorter sides have clear grinding evidence. This is strange, as usually the fatter and wider surface is used for grinding. One suggestion could be that the stone was used for dressing the animal hides or for other similar specialised tasks.

A128. A broken piece of a triangular sectioned pestle (?) in brownish granite. Both ends of the object are broken. The cross section reveals triangular profile. The preserved portion has smooth surface, suggesting grinding operations.

FLAT GRINDERS

A90. A grinding stone in dolerite. Both the flatter surfaces have grinding evidence, probably used for processing food.

A91. A flattish, nearly round grinding stone in dolerite. The flatter surfaces of both sides have grinding evidence. This could have been probably used for processing food.

HAMMER STONE

A85. A natural, flattish ovaloid stone, which has been used probably as a hammer as battering marks are noticed on one lateral side.

MARBLE AND HOPSCOTCH

A9. A small rounded stone ball in dolerite. Probably used as marble for playing.

A44. A small, cream coloured rounded stone ball. Probably used as marble for playing in calcareous stone. One surface of the ball is flattish. The surface of the ball is smoothened by grinding.

A50. A small, cream coloured rounded stone ball. Probably used as marble for playing made out of calcareous stone. One surface of the ball is flattish. The surface of the ball is smoothened by grinding.

A105. A small round stone ball in dolerite. Probably it was a playing marble. The ball has well-proportioned roundness.

A126. A stone hop-scotch in granite. A flatter flake was trimmed on the edges to obtain the roundness. No further work is evident.

POUNDERS OR DABBERS

A56. A round pounder or paddle in dolerite. The bottom, which is wider than upper portion is curved and smooth. The chipping marks are still evident around the bottom half. The upper body, though round, is constricted, probably to fix the handle. The same kind of paddles are used by the potters to support the clay lump from inside the pot under construction. There is also the possibility of using this tool for threshing the grains from the stack.

A57. A dabber in dolerite. The lower half of the tool is roundish and out flared having a diameter of 9 cm disc, which has a central knob with a diameter of 4.86 cm rising to a height of 3.5 cm. The tool was probably used as a dabber in pottery making. The bottom surface of the lower disc is curved and polished.

BLANKS AND FLAKES

A14. A semi-finished celt in dolerite. There is clear deep patina on one side and flake scars on the rest of the body. No pecking or grinding marks are visible. The blank seems to have been used as hammer as both the cutting and butt end sides have battering evidence. The smoothening on the mid-body suggests its hand held use.

A17. An irregular rectangular dolerite flake having two straight lines cutting each other in the middle on one side and a straight line on the other side. The exact purpose for which this object was made is not clear, but deliberate attempt in the manufacture of a tool is very obvious.

A28. A blank of a stone axe in dolerite. A clear evidence of selection of natural piece of suitable size with occasional flaking. The piece is nearly triangular in section, with three flat surfaces which retain cortex to some extent. The absence of pecking, grinding and polishing, is suggestive of its semi-finished state.

A37. A flattish, triangular blank in dolerite. The tool is unfinished. Extensive cortex on one side suggests selection of a natural flake for the blank. Small flake removal on both the sides resulted in perfect, near straight, balanced edges on the sides. The cutting edge is unfinished, as an unintended big fake off might have resulted in its abandonment.

A60. A tool blank in dolerite, obviously meant for a polished axe. The blank is in the first stage of preparing a tool as the blank is huge but very few flake scars without any further work. This specimen could be one of the finest examples of a tool under preparative stage.

A69. A natural dolerite piece, probably obtained as a blank to prepare a tool, but was not worked to finish it as a tool. Almost the complete body has the original cortex. This is an example of selection of suitably shaped natural stone pieces for manufacture of tools.

A76. A stone blank in dolerite, meant for making a celt. One side of the blank has heavy cortex. The blank was shaped only by flaking and no further work is evident on the blank.

A77. A stone blank in dolerite. The blank was shaped by flaking, which removed the entire cortex. The blank seems to have been abandoned due to a breakage on cutting edge side.

A79. A stone blank in dolerite. The blank was dressed only by flaking and no further work is evident.

A83. A stone 'blank' in dolerite for making polished tool. A flattish natural piece was trimmed by flaking on the sides to produce a 'shoe last' type butt. Both the flatter surfaces still retain extensive cortex. The cutting side which is not worked is straight. *The 'blank' importantly suggest that the cutting side was usually not flaked, as they wanted straight cutting edges, and that the flaking might result in uneven breakages. The cutting edge was meant to be reduced by grinding.*

A93. The butt end of an axe blank in dolerite. The tool has been shaped by flaking and rough pecking. The blank was probably abandoned due to the breakage on the cutting side.

A98. A natural flattish flake converted into a blank for making a flattish celt, in dolerite. Flaking is evident on the edges, but the blank has not been further worked.

Table 4. Metrical Measurements and Typo-technological Specifications of Stone Artefacts

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm			Weight (gm)
						L	W	TH.	
1	A1	Akkamakonda	Adze	Dolerite	Ground and polished	7.87	5.00	4.23	296
2	A109	Gunjikunta	Adze	Dolerite	Flaked, pecked, ground & polished tool	8.18	4.55	1.80	115
3	A16	Andepalli	Adze	Dolerite	Flaked & ground tool	13.18	4.90	2.71	286
4	A21	Hulikal	Adze	Dolerite	Only Flaked tool	12.74	7.94	2.70	326
5	A40	Budagavi	Adze	Dolerite	Flaked, pecked, ground & polished tool	10.13	6.22	3.44	325
6	A46	Budagavi	Adze	Dolerite	Flaked, pecked, ground & polished tool	13.55	5.45	3.48	427
7	A74	Kadamadevudu	Adze	Dolerite	Flaked, pecked & ground tool	11.82	4.11	4.65	409
8	A82	Lattavaram	Adze	Dolerite	Flaked , pecked, ground & polished tool	11.00	4.41	2.62	178
9	A106	Gunjikunta	Axe	Dolerite	Flaked, pecked, ground & polished tool	10.57	5.52	2.87	239
10	A113	Velpumadugu	Axe	Dolerite	Flaked, pecked, ground & polished tool	9.15	5.15	2.19	156
11	A120	Chakrypeta	Axe	Dolerite	Flaked, pecked, ground & polished tool	7.63	1.49	2.75	435
12	A130	Karutlapalle	Axe	Dolerite	Flaked, pecked, ground & polished tool	4.85	4.96	1.04	134
13	A132	Karutlapalle	Axe	Dolerite	Flaked, pecked & ground	3.04	3.63	2.33	103
14	A18	Vitlampalli	Axe	Dolerite	Pecked, ground & polished tool	14.20	7.00	3.31	518
15	A20	Vitlampalli	Axe	Dolerite	Pecked, ground & polished tool	10.12	4.70	3.66	227
16	A26	Palavoykonda	Axe	Dolerite	Pecked, ground & polished tool	11.49	6.78	3.50	421
17	A27	Palavoykonda	Axe	Dolerite	Polished &ground tool	6.48	3.73	2.15	98
18	A29	Palavoykonda	Axe	Dolerite	Pecked & ground tool	4.60	3.32	3.32	98
19	A30	Palavoykonda	Axe	Dolerite	Completely ground tool	11.98	4.60	3.42	300
20	A34	Pillapalikonda	Axe	Dolerite	Only Flaked tool	11.82	4.78	2.06	154
21	A35	Pillalapalikonda	Axe	Dolerite	Flaked, pecked & ground tool	9.46	6.04	2.33	162

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm			Weight (gm)
						L	W	TH.	
22	A38	Pillalapalikonda	Axe	Dolerite	Flaked, pecked & ground tool	14.81	4.95	3.98	537
23	A49	Gadekallu	Axe	Dolerite	Flaked , ground & polished tool	11.58	5.30	3.05	258
24	A58	Peddakonda	Axe	Dolerite	Flaked, pecked, ground & polished tool	15.50	17.92	4.94	645
25	A59	Chinnakonda	Axe	Dolerite	Pecked, ground & polished tool	10.85	6.11	3.57	359
26	A6	Akkamakonda	Axe	Dolerite	Flaked, pecked & ground tool	3.94	3.41	2.48	42
27	A63	Peddadandukonda	Axe	Dolerite	Pecked, ground & polished tool	6.50	7.93	3.90	344
28	A64	Peddadandukonda	Axe	Dolerite	Flaked, pecked & ground tool	10.81	6.33	2.26	221
29	A67	Chakryapeta	Axe	Dolerite	Flaked, pecked, ground & polished tool	14.05	7.20	4.07	420
30	A71	Kadamadevudu	Axe	Dolerite	Flaked, pecked & polished tool	15.25	6.95	4.41	598
31	A72	Kadamadevudu	Axe	Dolerite	Flaked & pecked tool	16.84	7.67	4.60	778
32	A73	Kadamadevudu	Axe	Dolerite	Flaked, pecked & ground tool	13.06	6.64	4.60	583
33	A86	Lattavaram	Axe	Dolerite	Flaked, pecked, ground & polished tool	12.73	5.64	2.42	267
34	A89	Malapuram	Axe	Dolerite	Flaked, ground & polished tool	13.70	5.20	1.86	242
35	A94	Kadamalakunta	Axe	Dolerite	Flaked, pecked & ground tool	13.63	5.44	4.23	501
36	A96	Kadamalakunta	Axe	Dolerite	Flaked, pecked, ground & polished tool	7.50	6.51	3.70	319
37	A22	Hulikal	Celt	Dolerite	Flaked & ground tool	11.11	6.51	2.76	240
38	A107	Gunjikunta	Celt	Dolerite	Pecked, ground & polished tool	8.02	5.05	1.38	101
39	A108	Gunjikunta	Celt	Dolerite	Ground & polished tool	7.01	3.57	1.05	46
40	A112	Velpumadugu	Celt	Dolerite	Flaked, pecked, ground & polished tool	6.72	4.76	1.70	100
41	A114	Velpumadugu	Celt	Dolerite	Flaked, ground & polished tool	6.26	2.87	1.26	42
42	A119	Nimbagal	Celt	Dolerite	Only pecked	7.62	4.70	2.50	124
43	A121	Chakryapeta	Celt	Dolerite	Flaked, pecked, ground & polished tool	6.53	1.80	1.36	58
44	A122	Chakryapeta	Celt	Dolerite	Flaked & ground	5.13	2.01	1.02	40
45	A13	Mudigallu	Celt	Dolerite	Pecked & ground tool	4.76	3.98	2.66	74
46	A15	Andepalli	Celt	Dolerite	Flaked, pecked, ground & polished tool	7.00	6.67	2.31	200
47	A19	Vitlampalli	Celt	Dolerite	Flaked, ground & polished tool	9.65	4.22	2.27	166

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm			Weight (gm)
						L	W	TH.	
48	A23	Hulikal	Celt	Dolerite	Flaked, pecked & ground tool	8.94	5.12	3.11	202
49	A25	Palavoykonda	Celt	Dolerite	Flaked & pecked & tool	8.40	4.93	2.62	203
50	A3	Akkamakonda	Celt	Dolerite	Pecked & ground tool	4.22	5.12	2.81	99
51	A36	Pillalapalikonda	Celt	Dolerite	Flaked, ground & polished tool	7.86	4.60	1.72	101
52	A4	Akkamakonda	Celt	Dolerite	Flaked, pecked & ground tool	9.21	3.72	5.14	274
53	A45	Budgavi	Celt	Dolerite	Flaked, ground & polished tool	4.57	5.67	1.70	92
54	A5	Akkamakonda	Celt	Dolerite	Pecked & ground tool	5.29	3.00	1.68	54
55	A61	Bunidibba	Celt	Dolerite	Flaked, pecked, ground & polished tool	10.25	4.71	2.50	171
56	A62	Peddadandukonda	Celt	Dolerite	Completely ground tool	8.31	5.17	2.12	142
57	A75	Kadamadevudu	Celt	Dolerite	Flaked, pecked, ground & polished tool	9.01	4.82	2.54	152
58	A87	Lattavaram	Celt	Dolerite	Flaked, pecked & ground tool	4.95	5.75	1.71	107
59	A95	Kadamalakunta	Celt	Dolerite	Flaked, pecked, ground & polished tool	7.40	5.70	2.72	218
60	A97	Kadamalakunta	Celt	Dolerite	Flaked, pecked, ground & polished tool	9.05	5.54	2.17	161
61	A100	Kadamalakunta	Chisel	Dolerite	Only Flaked	8.04	3.94	2.63	161
62	A66	Chakryapeta	Chisel	Dolerite	Flaked, pecked, ground & polished tool	6.76	3.71	1.70	62
63	A68	Karutlapalle	Chisel	Dolerite	Flaked, pecked & polished tool	11.05	3.86	3.17	228
64	A7	Akkamakonda	Chisel	Dolerite	Flaked, pecked & ground tool	8.68	5.71	2.41	196
65	A88	Lattavaram	Chisel	Dolerite	pecked & ground tool	5.75	3.60	1.71	53
66	A99	Kadamalakunta	Chisel	Dolerite	Flaked, ground & polished tool	10.24	3.40	2.03	153
67	A57	Gadekallu	Dabber	Dolerite	Only pecking		6.02	8.27	459
68	A90	Malapuram	Grinder	Dolerite	Completely ground	14.34	10.82	4.63	1479
69	A91	alapuram	Grinder	Dolerite	Completely ground	11.51	10.72	4.25	1140
70	A126	Chakryapeta	Hop scotch	Granite	Only Flaked	3.88	3.58	3.41	43
71	A105	Kadamalakunta	Marble	Dolerite	Pecked & ground		2.45	2.30	16
72	A44	Bhudagavi	Marble	Calcareous stone	Pecked & ground		2.24	2.09	16

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm			Weight (gm)
						L	W	TH.	
73	A50	Gadekallu	Marble	Calcareous stone	Pecked & ground		2.07	2.03	12
74	A9	Akkamakonda	Marble	Dolerite	Only pecked		3.11	2.04	33
75	A56	Gadekallu	Paddle	Dolerite	Chipping		9.85	8.86	1270
76	A127	Chakryapeta	Pestle	Granite	Pecked & ground	9.46	5.28	3.52	624
77	A128	Chakryapeta	Pestle	Granite	Pecked & ground	3.21	4.33	4.05	190
78	A2	Akkamakonda	Pestle	Dolerite	Only ground tool	4.88	3.12	2.61	78
79	A125	Chakryapet	Rubber	Dolerite	Only ground	7.93	6.24	1.35	240
80	A129	Chakryapeta	Rubber	Dolerite	Pecked & ground	4.19	3.25	1.71	129
81	A80	Peddamadlagondi	Rubber	Dolerite	Only ground tool	9.81	5.17	2.55	239
82	A84	Lattavaram	Rubber	Dolerite	Completely ground tool	10.63	4.31	2.41	201
83	A8	Akkamakonda	Stone ball	Granite	Pecked & ground tool		4.07	3.68	132
84	A10	Akkamakonda	Stone Ball	Olivine	Flaked & pecked		5.60	4.97	253
85	A101	Kadamalakunta	Stone Ball	Olivine	Flaked & ground		5.80	4.40	249
86	A102	Kadamalakunta	Stone Ball	Dolerite	Flaked & pecked		6.40	5.76	345
87	A103	Kadamalakunta	Stone Ball	Olivine	Flaked & ground		7.34	6.71	567
88	A104	Kadamalakunta	Stone Ball	Granite	Pecked & ground		6.03	5.10	232
89	A11	Mudigallu	Stone Ball	Granite	Only pecked		6.21	5.22	340
90	A110	Gunjikunta	Stone Ball	Olivine	Only pecked		6.72	5.69	395

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm L	W	TH.	Weight (gm)
91	A111	Gunjikunta	Stone Ball	Olivine	Only pecked		6.12	5.51	264
92	A115	Velpumadugu	Stone Ball	Olivine	Only pecked		6.06	4.92	312
93	A116	Velpumadugu	Stone Ball	Dolerite	Only pecked		5.77	5.38	291
94	A117	Velpumadugu	Stone Ball	Granite	Pecked & ground		5.05	4.69	214
95	A118	Velpumadugu	Stone Ball	Dolerite	Pecked & ground		6.36	6.13	400
96	A12	Mudigallu	Stone Ball	Olivine	Flaked & pecked		5.68	4.34	201
97	A123	Chakryapeta	Stone Ball	Olivine	Pecked & ground		4.05	3.85	214
98	A124	Chakryapeta	Stone Ball	Olivine	Pecked & ground		4.50	4.01	231
99	A131	Karutlapalle	Stone Ball	Dolerite	Pecked & ground		5.85	3.33	313
100	A24	Hulikal	Stone Ball	Dolerite	Only pecked tool		6.60	6.14	440
101	A31	Palavoykonda	Stone Ball	Dolerite	Pecked & polished		6.28	44.14	315
102	A32	Palavoykonda	Stone Ball	quartz	Pecked & ground		6.05	4.34	211
103	A33	Palavoykonda	Stone Ball	Granite	Pecked & ground		4.93	4.90	169

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm L	W	TH.	Weight (gm)
104	A41	Budagavi	Stone Ball	Granite	Only pecked		5.26	4.97	209
105	A42	Budagavi	Stone Ball	Granite	Only pecked		4.94	4.88	203
106	A43	Budagavi	Stone Ball	Granite	Only pecked		5.76	5.15	256
107	A47	Budagavi	Stone Ball	Granite	Only pecked		4.86	4.78	241
108	A48	Budagavi	Stone Ball	Granite	Only pecked		5.21	4.80	183
109	A51	Gadekallu	Stone Ball	Olivine	Pecked & ground		5.37	4.46	259
110	A52	Gadekallu	Stone Ball	Granite	Pecked & ground		6.53	6.01	368
111	A53	Gadekallu	Stone Ball	quartz	Only pecked		6.18	4.77	282
112	A54	Gadekallu	Stone Ball	Olivine	Pecked & ground		7.11	4.23	347
113	A55	Gadekallu	Stone Ball	Granite	Only pecked		6.23	4.38	292
114	A65	Peddadandukonda	Stone Ball	Olivine	Pecked & ground		5.21	4.49	175
115	A70	Dayyalakuntapalle	Stone Ball	Olivine	Only pecked		5.42	4.45	278
116	A78	Kadamadevudu	Stone Ball	Olivine	Pecked & ground		6.31	4.89	284

Sl. no	Ant. no	Site	Artefact type	Material	Technology	Size in cm			Weight (gm)
						L	W	TH.	
117	A85	Lattavaram	Stone hammer	Dolerite	Pecked & ground tool	7.26	3.87	2.23	107
118	A14	Andepalli	Tool blank	Dolerite	Only Flaked	9.80	5.32	3.12	278
119	A17	Andepalli	Tool blank	Dolerite	Cut marks	4.12	4.22	1.10	47
120	A28	Palavoykkonda	Tool blank	Dolerite	Only Flaked tool	9.15	4.82	3.64	233
121	A37	Pillalapalikonda	Tool blank	Dolerite	Only Flaked tool	10.82	5.51	1.97	155
122	A60	Chinnakonda	Tool blank	Dolerite	Only Flaked tool	15.34	7.78	4.49	498
123	A69	Karutlapalle	Tool blank	Dolerite	Only Flaked	20.23	7.03	3.18	716
124	A76	Kadamadevudu	Tool blank	Dolerite	Only Flaked	7.27	4.46	1.84	66
125	A77	Kadamadevuvu	Tool blank	Dolerite	Only Flaked	6.97	4.31	1.51	52
126	A79	Peddamadlagondi	Tool blank	Dolerite	Only Flaked	8.37	4.96	2.05	133
127	A83	Lattavaram	Tool blank	Dolerite	Only Flaked	10.87	6.70	2.83	281
128	A93	Kadamalakunta	Tool blank	Dolerite	Flaked & pecked tool	12.17	7.74	4.56	699
129	A98	Kadamalakunta	Tool blank	Dolerite	Only Flaked	7.98	4.25	9.15	62

POTTERY

Very often most ceramic collections from surface as well as those recovered from excavation are incomplete and this makes it hard to determine form from sherds. It is no doubt the same with the present study of the surface finds. A total of 388 pot-sherds constitutes the total strength of the ceramic collection. They consist mostly of small fragments difficult to determine whether the sherd came from top or bottom of the vessels. "if whole vessels were smashed in place either at the time of deposition or shortly thereafter, the pieces can usually be glued back together and the vessels is as good as new,"[36] for reconstructing the form and type of the vessels. The approach begins by grouping sherds with attributes such as rim, surface colour and treatment, decoration or designs etc. After completion of general grouping, Caliper was used to measure the rim height and width, and all sherds were drawn following the standard diameter-measurement template, in centimetre units graph.[37] Furthermore, the Munsell soil chart was used to determine the sherds colours. Both exterior and interior surface colour were recorded, with assigned alpha numeric code of the chart. The cores of the sherds were examined, to see the colour variation which could suggest the method of firing. Other attributes such as application of slip and burnish on the surface, and manufacturing techniques were recorded for each sherd. For example, some sherds showed evidence of shallow and rotational scraping on the interior surface suggesting the use of paddle or dabbers in forming the pots. A total of eighty one (81) rim sherds were selected for the study because most of the sherds display the same character and some were too

[36] Prudence M. Rice, *Pottery Analysis: A source book* (Chicago: University of Chicago Press, 1987), 222.

[37] I would like to thank Akinori Uesugi, for his help in drawing the pottery sherds for the study.

fragmentary. All the sherds were subjected to description, which is attached at the end of the section and a detailed recording of technological attributes is shown in **Table 6**.

On the basis of surface colour, the potsherds collected have been classified into four main wares – grey ware, dull red ware, slipped ware, black and red ware. Of the four types slipped ware attains the highest percentage with a total of thirty one (31) sherds, black and red ware comprises of fifteen (15) sherds, dull red ware with nineteen (19) sherds and grey ware forms only sixteen (16) sherds of the pottery collection. The wares are then classified into a number of sub-wares based on surface treatment, technique of manufacture, shape and decoration.[38] Table 7 and Chart-3 shows the categories of pottery types and their frequency. The study shall thus confine to noting of these mentioned wares above and to a brief description of each ware of the different varieties and also of the types as revealed from drawn sherds.

Table 7. Categories of Pottery and their Frequency

Categories	Sub-types	Number of potsherds
Dull Red Ware		
	Burnished	10
	Unburnished	9
	Total	**19 (23.46%)**
Grey Ware		
	Burnished	9
	Unburnished	7
	Total	**16 (19.75%)**
Slipped Ware		
	Red Slipped	20
	Black Slipped	11
	Total	**31 (38.27%)**
Black and Red Ware		**15 (18.52%)**
	Grand Total	**81 100%**

[38] V. Rami Reddy, *A Study of the Neolithic Culture of Southwestern Andhra Pradesh*, 78.

Grey Ware

Under this category two varieties have been included – unburnished grey ware and burnished grey ware, based on firing, treatment and use of clay as inferred from the specimens (Plate-11 & Plate-12). This ware is characterised by grey core due to low firing. The presence of micaceous clay makes the appearance gritty and coarse. The surface treatment showed that majority are grey to yellowish grey on the exterior, while the interior is black. The sherds consist of thin, medium as well as thick types of ware. No, decorations and design have been revealed from the present collection, though such references of impressed and incised designs have been mentioned in earlier reports.[39] There is an evident difference in surface treatment as revealed among the two sub wares. The unburnished or coarse grey ware with a total of seven (7) sherds are without any surface burnish or slip. Most of the rim sherds orientation showed non-rotational techniques in forming the vessels. The vessels are crudely made and shows high content of mica about 0.5 mm on the outer surface as well as inner. The identified vessel types in this sub-ware are long spouted pots, bowls of globular spouted, channel spouted, featureless rim and wide mouthed.

The burnished ware variety consists of nine (9) sherds in total. The external surface treatment are burnished and they exhibit a fine smooth appearance. In wide mouthed vessels the burnish is present inside and out. Most of the sherds show evidence of slow rotational smoothening process. The types in this ware are pots of high necked and out curved rim, convex and concave flaring rims and carinated pots. Other types consist of wide-mouthed bowls.

[39] Reddy, *Neolithic Culture of Southwestern Andhra Pradesh, The Prehistoric and Protohistoric Cultures of Palavoy, South India;* Allchin, *Piklihal Excavations,* have reported on the evidence of decorations and design on the same ware.

Dull Red Ware

The dull red ware records a total of nineteen (19) sherds. The surface colour varies from brown, light brown, reddish brown, orange, dull orange and light yellow, while the interior is often black. The ware is coarse in fabric and exhibits an uneven surface. The clay is mixed with a considerable amount of micaceous materials which could be seen in the core as well as in the outer surface of few sherds. They comprised of thin and medium ware and grey to orange core in most of the sherds. The ware is devoid of decoration or designs. Based on the surface treatment, the ware is divided into two varieties – unburnished and burnished dull red ware.

The unburnished variety with a total of nine (9) sherds is distinguished by coarse fabric with mica particles. They are ill fired as is seen from the cross section revealing grey to orange core. The sherd striations showed slow rotation and surface smoothening with some kind of hard tool. Scraping in the interior could be seen in few of the sherds e.g., A5. The types in this variety are pots with convex flaring rims, convex cylindrical neck and straight convex rims. The bowls variety includes globular, shallow and bowl cum-lid.

The second variety constitutes ten (10) sherds in the dull red ware. The surface treatment in this sub-ware reveals burnishing and some sherds are given streak burnishing. In few sherds the burnish was only partially applied and thin slip applied to its surface. The sherds reveal rotational smoothening technique. In one case (A362) finger impression is seen probably the spout joined to the body later. The types in pots are ring footed, globular spouted, concave neck flaring rims and bowls comprise of small flat bottom, wide mouth, round bottom carinated rims and globular bowls.

Slipped Ware

This slipped ware is distinguished by a fine smooth surface without any trace of mica. The sherds have been treated with slip either lightly or sometimes deeply. The method of application has not been studied, but it is probable that "a ferruginous oxide ground and mixed with water was applied to the surface of the pot before burnishing"[40] to give its glossy appearance. Some potsherds have paintings on this applied slip, especially on the red slipped ware. Under this category based on surface colour two varieties are identified red slipped and black slipped ware. This ware attains the highest content with a total of thirty one (31) potsherds.

A total of twenty (20) sherds in red slipped ware are fine and medium coarse fabric, though some potsherds in impure gritty core is also present (Plate-14). The sherds show a considerable regularity of body thickness and of fine burnishing. Instance of streak burnishing is also noticed. The core is orange to grey, shows a more consistent temperature in firing than the other wares. This taken together, suggests that the vessels are wheel thrown. Most of the sherds are treated with slip, over which some show evidence of painting. Some of the sherds show evidence of black slip on the interior. The shapes noticed are perforated bowl, straight sided bowl, straight sided wide mouthed bowl, globular bowl, short concave and convex neck pot, high neck pot, wide mouthed clubbed rim pot and flat base pot. The painted decoration are in simple bands around the neck, wavy lines, slanting lines and 'x' strokes.

The black slipped ware with a total of eleven (11) sherds differs from the former ware in that a smooth black slip is uniformly applied on the external as well as internal, giving a shiny appearance. They are black in colour both internally and externally. The ware is fine quality, medium to thick fabric. None of the sherds exhibits mica content

[40] Allchin, *Piklihal Excavations,* 29.

and is devoid of decorations. Burnishing in streak and parallel lines are noticed on external surfaces (Plate-10). The core is black, which shows a consistent temperature range in firing and that the pots are well fired. The smoothening of the surface is so regular that reveals every appearance of rotational wheel made. The types in this ware are confined to bowls of different types, only a single miniature high necked out turned rim pot is example among the ware. The types in the bowls are convex sided wide shallow, wide mouthed and straight sided.

Black and Red Ware

This ware is characterised by black in the interior and exterior top, and red on the exterior body. In total fifteen (15) sherds were found. The surfaces are fine burnished with lines of parallel and streaks. The ware is wheel made as is evident from the rotation smoothening of the surface and straiations (Plate-10). The sherds reveal black core. The clay is fine and it varies from thin to medium thick body. The distinctive feature of this ware is their wide range of bowls in small and medium sizes. They are shallow open bowls, double carinated bowls, straight sided, globular bowls, sagger based bowls and a small footed base pot.

Vessel Form and Shapes

The potsherds with the wares described above are divided into two types – pots and bowls as evident from the form and shape of each sherd.

Pots

Under this category are pots with restricted and unrestricted mouth. They are found to have short and high concave neck, cylindrical neck and high footed base or saggered base and ring footed base with convex flaring rims, clubbed rims and carinated pots. Though minimal, globular spouted pots with short concave neck types were also found.

The pots are represented in all the main wares and sub wares, except for a solitary sherd in black and red ware. The variant types as noticed from 34 sherds are described below (Fig. 17-22.)

Type 1 these are wide-mouthed pots with convex flaring rims. The variant are found in 10 sherds in burnished grey ware, unburnished dull red ware and red slipped ware. As evident from the ware, these type seems to be a characteristic of the Neolithic though they continued in later period.

Type 2 is the second variety of a group of wide-mouthed pots of concave neck with clubbed rim. These are found in 7 sherds of burnished grey ware, burnished red ware and red slipped ware. The concave neck with clubbed rim are found only in two sherds of red slipped ware (A11 and A13).

Type 3 is the third variety of wide-mouthed pots with constricted neck. They are represented by 3 sherds of burnished grey ware, unburnished dull red ware and red slipped ware.

Type 4. These are high necked pots of out-curved and out-turned rims. A total of 5 sherds are found in unburnished grey ware, unburnished dull red ware, red slipped and black slipped ware.

Type 5 is represented by two identical fragment A287 and A286 of hollow footed in burnished dull red and black and red ware (Fig. 19). The fragment A286 smaller in size, is fit to be called a cup. This similar type has been reported from Piklihal, and Allchin has compared this to the 'footed chalices' of Shah Tepe.[41]

[41] Ibid., 44.

Type 6 includes three spouted pots of burnished red and unburnished grey ware. They are medium sized globular pots with short concave neck (Fig. 22). These type of spouts are common occurrences at Neolithic sites in the region as well in the Deccan.[42]

Type 7 is represented by A125, a flat base red slipped ware pot (Fig. 20). It is slightly rounded at the base, a characteristic of Neolithic pottery bases.

Bowls

Bowls include round or deep dish. Generally, they are wide mouthed with concave or convex sides and the bottom usually roundish. A total of 47 sherds constitutes the collection in this category. The variant types as evident from the sherds are described below (Fig. 23-28).

Type 1. These are wide shallow bowls with convex and tapering sides. They are found in 6 sherds of black slipped, dull red ware and black and red ware.

Type 2. This type include a variety of wide mouth with convex and concave sides, and out turned rim bowls. They are found in almost all the wares with a total of 8 sherds. As revealed from the ware the type seems to have been found throughout the Neolithic.

Type 3. This type is represented by bowls of straight sided and out turned rims. Some of these bowls are wide at the mouth and few slightly deeper. They are in black and red ware, and slipped ware found in 6 sherds.

Type 4. These are globular bowls with convex sides and out turned rims. The 6 illustrated examples are in wares of unburnished grey, unburnished dull red, black slipped, red slipped and black and red wares.

[42] Spouted pots and bowls have been reported from Palavoy, of the study region and Piklihal excavations.

Type 5 includes two channel spouted and a globular short spouted bowls. They are in unburnished grey ware of coarse fabric with mica content and are handmade.

Type 6. The type is illustrated by two examples of lid cum bowl in buff and unburnished dull red ware.

Type 7. These includes two examples of sagger based bowls in black and red ware.

Type 8 is a featureless rim bowl in unburnished grey ware.

Type 9 is a variant of flat bottom bowl in burnished dull red ware.

Type 10 is an example of perforated bowl in red slipped ware (Plate-13). The perforations are pierced only at the bottom base.[43]

Painted Designs

These consist of minor collection with a total of 7 sherds. They are characteristics of red slipped ware, only one design of black and red ware is found. Of the forms 4 are painted on bowls and 3 on pots. The designs are found painted in white and buff on the surface usually on their neck and shoulder, and on the rim. The designs are described below: (Plate-15, Fig. 29-30).

A222. A group of slanting lines arranged in mirror pattern painted in white.

A30. Painted in white with broken slanting lines.

A299. Externally painted with slanting lines touching the rim.

A256. The outer surface of a thick red slipped ware pot below the rim is painted with two horizontal bands in grey colour.

A369. Externally painted with a thick wavy lines in haphazard thickness below the rim on which painted vertical strokes are drawn.

[43] The functional use of this perforated vessels as found at Piklihal, has been suggested its use as covers for milk boiling, for straining liquids or for some kind of cooking.

A394. A group of vertical lines painted in grey and on the right joined by three slanting lines.

A378. Externally painted with vertical short strokes on the inner side of the mouth and shoulder decorated with ‘x’ strokes in a line.

Conclusion

The study of the selected pot sherds, though small in number and keeping in mind that still the evidence is a significant indicator to understand their pottery traditions, an effort has been made to summarize as the evidences allow. The wares as revealed from the sherds are, the largest percentage of ware occur in the slipped ware with a total of thirty one (31) sherds, the dull red ware comprise nineteen (19) sherds, grey ware sixteen (16) sherds and black and red ware a total of fifteen (15) sherds. In comparative relation, burnished sherds are more than that of unburnished sherds in both grey and dull red wares. The vessel forms showed that not all the wares represent the types and designs. Pots with various types are confined to grey ware, dull red ware and red slipped ware. Only a miniature pot with high necked out curved rim in black slipped ware and a hollow footed pot in black and red ware are found. The bowl types of wide shallow, wide mouthed convex and convex sides, straight sided and globular are found to be present in all the wares.

It is also noticed that certain types of bowls are found in specific wares only, for instance, channel spouted in grey ware, sagger base in black and red ware, perforated in red slipped, lid-cum bowl and flat bottom base in dull red ware. Also is the globular spouted pot in grey ware. The present findings of pot sherds show that the wares and the typology as evident are common occurrence in the region as seen from the earlier works. Taking into account, the fact that attention has been paid to the pottery collection of

representative ware, it is best to consider this small section as an understanding of Neolithic pottery. As mentioned earlier, this is a mere attempt to note the wares presence and a possible attempt at studying the form of the vessels from the sherds.

Table 6. Typo-technological and other attributes of Potsherds

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A33	Fine	Burnished	Rotational smoothening	Dark grey N3	Grey N2	Grey N4	Grey ware	Pot
A120	Fine	Slipped	Rotational smoothening	Red 10R 5/6	Red 10R 5/6	Orange 2.5 R6/6	Red slipped	Bowl
A286	Fine	Slipped	Rotational smoothening	Dark grey N3	Dull reddish brown 5R 5/4	Dull orange 7.5 R7/3	Black and red	Pot
A287	Fine	Burnished	Slow rotational smoothening	Reddish brown 2.5 R5/6	Dull orange 5R 7/4	Dull orange 5R 7/4	Dull red	Pot
A365	Fine	Streak burnished	Slow rotational smoothening	Dark grey N/3	Dark Purplish grey 5P 4/1	Dark purplish grey 5P 4/1	Black slipped	Pot
A125	Fine	Streak burnished	Slow rotational smoothening	Reddish brown 2.5 4/0	Black N/2	Grey N4	Red slipped	Pot
A121	Fine	Burnished	Rotational smoothening	Dark grey N/3	Orange 7.5 R7/6	Grey N4	Black and red	Bowl
A222	Fine	Slipped	Rotational smoothening	Reddish brown 2.5 R4/6	Orange 5R 7/6	Dull orange 5R 6/4	Red slipped	Bowl
A30	Fine	Burnished	Rotational smoothening	Dull reddish brown 2.5 R4/6	Black N2	Grey N4	Black and red	Bowl
A299	Fine	Slipped	Rotational smoothing	Greyish red 10R 4/2	Greyish red 10R 4/2	Grey N4	Buff	Bowl

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A378	Fine	Slipped and streak burnished	Slow rotational smoothing	Red 10R 5/6	Grey N4	Grey N5	Red slipped	Pot
A250	Mica particles	Burnished	Slow rotational smoothening	Yellowish grey 2.5 6/1	Yellowish grey 2.5 6/1	Yellowish grey 2.5 5/1	Burnished grey	Pot
A369	Fine	Streak burnished	Rotational smoothening	Reddish brown 2.5 R5/6	Reddish brown 2.5 R5/6	Dull orange 5R 7/4	Red slipped	Bowl
A256	Fine	Slipped	Rotational smoothening	Reddish brown 2.5 R5/6	Reddish brown 2.5 R5/6	Grey N4	Red slipped	Bowl
A154	Mica particles(0.5mm)	Non-slipped	Non rotational or hand made	Grey N5	Grey N5	Grey N5	Unburnished grey	Channel spouted bowl
A165	Mica particles (0.5mm)	Burnished	Slow rotational smoothening	Dull yellow orange 10R 6/3	Grey N4	Grey N4	Burnished grey	Bowl
A170	Mica particles	Non-slipped	Non rotational or handmade	Grey N4	Light yellow 2-5 7/3	Grey N4	Unburnished	Bowl
A361	Coarse	Non-slipped	Non-rotational/scrapin g	Grey N4	Grey N4	Grey N4	Unburnished	Bowl
A229	Fine	Burnished	Slow rotational smoothening	Greyish yellow 2.5 7/2	Grey N4	Grey N4	Burnished grey	Pot
A354	Fine	Burnished	Slow rotational smoothening	Light yellow 2.5 7/3	Yellowish grey 2.5 5/1	Grey N4	Burnished grey	Pot
A336	Fine	Rough burnished	Slow rotational smoothening	Grey N4	Grey N4	Grey N4	Burnished grey	Pot

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A179	Mica particles (0.5 mm)	Slightly burnished	Non rotational smoothening	Greyish yellow brown 10R 5/2	Greyish yellow brown 10R 6/2	Grey N4	Unburnished	Spouted pot
A155	Mica particles (0.5mm)	Burnished	Slow rotational smoothing	Light yellow 2.5 7/3	Grey N4	Grey N4	Burnished grey	Pot
A364	Mica particles (0.5mm	Streak burnished	Non rotational smoothing	Dark grey N3	Dark grey N3	Grey N4	Unburnished grey	Spouted pot
A156	Mica particles (0.5mm)	Non-slipped	Non rotational smoothening	Grey n4	Dull orange 7.5 R6/4	Grey N4	Unburnished grey	Channel spouted bowl
A262	Fine	Streak burnished	Rotational smoothening	Black N2	Reddish brown 2.5 R5/6	Grey N4	Black and red	Bowl
A232	Fine	Slipped	Rotational smoothening	Greyish red 2.5 R4/2	Greyish red 2.5 R4/2	Yellowish grey 2.5 5/1	Buff	Lid cum bowl
A11	Fine	Slipped	Rotational smoothening	Red 10R 4/8	Orange 2.5 R6/10	Dark grey N3	Red slipped	Pot
A228	Fine	Slipped	Rotational smoothening	Red 10R 5/6	Red 10R 5/6	Dull orange 5 R7/4	Red slipped	Bowl
A87	Fine	Slipped	Rotational smoothening	Red 10R 4/6	Reddish brown 10R 4/6	Dull orange 5 R7/4	Red slipped	Bowl
A313	Fine	Slipped	Rotational smoothening	Red 10R 4/6	Dull orange 5 R 7/4	Grey N5	Red slipped	Bowl
A106	Fine	Slipped	Rotational smoothening	Red 10R 4/6	Red 10R 4/6	Dull orange 5 R7/4	Red slipped	Bowl

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A2	Fine	Slipped	Rotational smoothening	Red 10R 4/6	Red 10R 4/6	Orange 2.5 R6/6	Red slipped	Perforated bowl
A372	Fine	Slipped and streak burnished	Rotational smoothening	Black N2	Orange 7.5 R6/6	Grey N4	Black and red	Globular bowl
A38	Fine	Slipped	Rotational smoothening	Black N2	Black N2	Grey N4	Black slipped	Bowl
A393	Fine	Burnished	Rotational smoothening	Black N2	Dull orange 7.5 R6/4	Grey N4	Black and red	Bowl
A122	Fine	Slipped and burnished	Rotational smoothening	Dark grey N3	Bright brown 7.5 R5/6	Grey N4	Black slipped	Bowl
A13	Fine	Slipped	Rotational smoothening	Black N2	Reddish grey 2.5 R4/1	Black N2	Red slipped	Pot
A344	Fine	Slipped and streak burnished	Rotational smoothening	Bright reddish brown 2.5 R5/6	Black N2	Grey N4	Black and red	Bowl
A8	Fine	Slipped and streak burnished	Rotational smoothening	Black N2	Reddish brown 10R 4/3	Grey N4	Black slipped	Bowl
A387	Fine	Slipped and parallel burnished	Rotational smoothening	Dark grey n3	Dull reddish brown 5R 5/6	Grey N4	Black and red	Bowl
A82	Fine	slipped and burnished	Rotational smoothening	Black N2	Reddish brown 2.5R 4/6	Grey N4	Black and red	Bowl
A260	Fine	Burnished	Rotational smoothening	Black N2	Dull reddish brown 5R 5/6	Grey N4	Black and red	Globular bowl

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A276	Fine	Burnished	Rotational smoothening	Black N2	Black N2	Grey N4	Black and red	Bowl
A261	Fine	Streak burnished	Rotational smoothening	Bright reddish brown 2.5 R5/6	Black N2	Grey N4	Black and red	Sagger based bowl
A83	Fine	Burnished	Rotational smoothening	Dull reddish brown 5R 5/4	Black N2	Dark grey N3	Black and red	Bowl
A85	Fine	Streak burnished	Rotational smoothening	Black N2	Black N2	Grey N4	Black slipped	Bowl
A379	Fine	Slipped and burnished	Rotational smoothening	Black N2	Black N2	Grey N4	Black slipped	Bowl
A377	Fine	Parallel streak burnished	Rotational smoothening	Black N2	Black N2	Grey N4	Black slipped	Bowl
A264	Fine	Burnished	Rotational smoothening	Black N2	Black N2	Grey N4	Black slipped	Bowl
A104	Fine	Burnished	Rotational smoothening	Reddish brown 5R 4/6	Black N2	Grey N4	Black and red	Globular bowl
A263	Fine	Streak burnished	Rotational smoothening	Black N2	Black N2	Grey N4	Black slipped	Bowl
A41	Fine Mica particles	Burnished	Rotational smoothening	Dull orange 7.5 R6/4	Dull orange 7.5 R7/4	Brownish grey 10 R4/1	Burnished red	Bowl
A334	Fine	Burnished	Slow rotational smoothening	Dull orange 7.5 R6/3	Dull orange 7.5 R6/3	Grey N4	Burnished grey	Pot

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A282	Coarse white particles (1mm)	Non-slipped	Slow rotational using some hard tool	Dull orange 7.5 R4/6	Dull orange 7.5 R4/6	Grey N4	Unburnished red	Pot
A281	Fine white particles (0.5 mm)	Non slipped	Slow rotational using some hard tool	Dull yellow 2.5 6/2	Dull reddish orange 5R 5/4	Dull orange 7.5 R6/4	Unburnished red	Pot
A353	Mica particles (0.5 mm)	Non-slipped	Non-rotational/handmade	Dull yellow 2.5 6/2	Dull reddish orange 5 R5/4	Dull orange 7.5 R6/4	Unburnished grey	Pot
A5	Rotational scraping	Non-slipped	Rotational smoothening	Orange 2.5 R6/6	Orange 2.5 R6/6	Orange 2.5 R6/6	Unburnished red	Globular bowl
A270	Fine	Burnished	Rotational smoothening	Bright reddish brown 2.5 R5/6	Dark grey N3	Orange 2.5 R6/6	Burnished red	Flat bottom bowl
A77	Fine	Burnished	Rotational smoothening	Black N2	Grey N4	Orange 5 R6/6	Black and red	Bowl
A42	Fine Mica particles	Burnished	Non rotational/ shallow scraping	Reddish brown 2.5 R5/6	Black N2	Dull orange 5 R6/4	Burnished red	Bowl
A13	Fine	Slipped	Rotational smoothening	Bright reddish brown 2.5 R5/1	Bright reddish brown 2.5 R5/1	Dull orange 5 R7/4	Red slipped	Pot
A80	Fine	Streak burnished	Rotational smoothening	Bright reddish brown 2.5 R5/6	Brown 2.5 R5/6	Dull orange 5 R7/4	Burnished red	Globular bowl
A68	Fine	Slipped and burnished	Rotational smoothening	Red 10R 5/6	Dark grey N3	Dull orange 5R 7/3	Red slipped	Bowl

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A113	Fine	Streak burnished	Rotational smoothening	Dull redish brown 2.5R 4/4	Black N2	Dull orange 5R 7/3	Red slipped	Pot
A127	Fine	Non-slipped	Rotational smoothening	Bright reddish brown 2.5R 5/6	Dark grey N3	Dull orange 7.5R 7/4	Unburnished red	Bowl
A169	Fine	Slipped and streak burnished	Rotational smoothening	Dull reddish brown 5R 4/3	Grey N4	Dull yellow orange 10R 7/3	Red slipped	Pot
A192	Fine	Slightly burnished	Smoothening with some narrow hard tool	Bright reddish brown 2.5R 5/6	Dark grey N3	Grey N4	Unburnished red	Pot
A217	Fine	Slipped	Rotational smoothening	Red 10R 5/6	Dull orange 5R 7/4	Grey N5	Red slipped	Pot
A226	Fine	Burnished	Rotational smoothening	Orange 2.5R 6/6	Orange 2.5R 6/6	Orange 2.5R 6/6	Unburnished red	Bowl cum-lid
A363	Fine	Slipped and streak burnished	Slow rotational smoothening	Bright reddish brown 2.5R 5/6	Dark reddish grey 2.5R 6/6	Orange 5R 6/6	Red slipped	Pot
A294	Fine	Burnished	Slow rotational smoothening	Dull orange 7.5r 7/4	Grey N4	Grey N4	Unburnished red	Pot
A163	Fine	Burnished	Slow rotational smoothening	Dull orange 5R 6/4	Brownish grey 10R 5/1	Grey N5	Unburnished red	Pot
A381	Fine	Slipped and streak burnished	Slow rotational smoothening	Reddish brown 2.5 R4/6	Dark grey N3	Grey N5	Burnished red	Bowl
A210	Fine	Slipped and steak burnished	Non rotational smoothening	Dull orange 5R 7/6	Dark grey N3	Grey N3	Burnished red	Pot

Artefact code	Fabric type	Surface treatment	Manufacturing technique	Surface colour		Core colour	Ware type	Vessel type
				Out	In			
A215	Fine	Slipped	Rotational smoothening	Red 10R 4/6	Red 10R 4/6	Dull orange 5R 7/4	Burnished red	Bowl
A362	Fine white particles (0.5 mm)	Slipped and burnished	Rotational smoothening	Dull yellow orange 10R 7/3	Dark grey N3	Dull reddish brown 2.5R 5/3	Burnished red	Spouted pot
A367	Fine	Slipped and streak burnished	Non-rotational smoothening	Orange 7.5R 7/6	Black N2	Black N2	Burnished red	Bowl

POTTERY DESCRIPTION

The selected 80 sherds for the study are described in detail below:

A2. Red slipped bowl strainer with narrow perforations at the bottom.

A5. Sherd of a globular bowl in plain red ware.

A8. Sherd of a thick, black slipped ware bowl.

A11. Rim portion of a red slipped ware, wide mouthed and clubbed rim pot.

A13. Rim portion of a red slipped ware pot with clubbed rim.

A30. Black and Red ware bowl with white painting.

A33. Rim portion of a burnished grey ware wide mouthed and short concave neck pot.

A38. Rim portion of a black slipped ware.

A41. Wide mouthed deep bowl in micaceous red ware.

A42. Sherd of a red ware with slip above the shoulder.

A57. Rim portion of a red slipped ware wide mouthed with short concave neck pot.

A68. Rim portion of a straight sided bowl in red slipped ware.

A77. Sherd of a wide bowl in black and red ware.

A80. Rim portion of a light brownish red globular bowl.

A82. Sherd of a wide bowl in black and red ware.

A83. Sherd of a black and red ware bowl.

A87. Rim portion of a wide, shallow bowl in black slipped ware.

A104. Sherd of a globular bowl in black and red ware.

A106. Rim portion of a medium coarse bowl in red slipped ware.

A113. Rim portion of a red slipped ware wide mouthed pot, constricted neck with black slip on the exterior.

A120. Rim portion of a globular bowl in red slipped ware.

A121. Rim portion of a straight sided black and red ware bowl.

A122. Sherd of a straight sided bowl in black slipped ware.

A125. Flat base of a red slipped ware.

A127. Sherd of an ill-fired plain red ware shallow bowl.

A154. Rim and top portion of a handmade channel spouted bowl in grey ware.

A155. Rim piece of a burnished grey ware wide mouthed convex flaring rim pot.

A156. Rim portion of a handmade grey ware channel spouted bowl.

A163. Rim portion of a dull red ware wide mouthed pot with convex flaring rims.

A164. Rim of a grey ware bowl with featureless rim.

A165. Sherd of a roundish wide mouthed bowl in burnished grey ware.

A169. Rim portion of a small pot with convex flaring rim in brownish red slipped ware.

A170. Sherd of a globular bowl in micaceous grey ware.

A179. Globular bowl in grey ware with a short spout

A192. Rim portion of an ill-fired red ware with light wash on the body. The pot is wide mouthed with convex flaring rims.

A210. Sherd of a medium coarse ware pot having internally black slip, but no external slip. The external surface is light brownish red.

A213. Rim portion of a wide, shallow bowl in black slipped ware.A217. Rim portion of a red slipped ware, wide mouthed convex flaring rim pot.

A215. Sherd of a bowl having round bottom in red ware with wash of the same colour.

A222. Straight sided red slipped ware bowl with white painting.

A226. Rim portion of a red ware lid A229. Rim portion of a thick burnished grey ware wide mouthed, convex flaring rim pot.

A228. Straight sided wide mouthed, straight sided bowl in red slipped ware.

A232. Rim portion of a buff ware lid.

A250. Rim portion of a burnished grey ware pot with constricted neck.

A256. Rim portion of a medium, thick red slipped ware with grey painting.

A260. Sherd of a globular bowl in black and red ware.

A261. Sherd of a black and red ware sagger based bowl.

A262. Sherd of a thick shallow black and red ware bowl in medium fine fabric

A263. Sherd of a straight sided deep bowl in fine black slipped ware.

A264. Sherd of a wide mouthed bowl in black and red ware.

A270. Bottom sherd of a flat bottomed black and red ware bowl.

A276. Rim portion of a fine black slipped ware bowl.

A281. Dull red ware pot with, out curved rim.

A282. Rim portion of a dull red ware pot in coarse fabric. The pot is high necked and has out turned rim

A286. Miniature pot with hollow base

A287. Portion of a hollow base red ware pot.

A294. Rim portion of a dull red ware wide mouthed pot with convex flaring rims.

A299. Rim piece of a straight sided bowl in red ware with buff painting.

A313. Rim portion of a large red slipped ware pot with constricted neck.

A334. Rim portion of a thick sectioned burnished grey ware wide mouthed convex flaring rim pot.

A336. Rim of a burnished grey ware pot, wide mouthed and convex flaring rims.

A344. Straight sided bowl in black and red ware.

A353. Rim portion of a burnished grey ware wide mouthed and short concave neck pot.

A354. Rim portion of a burnished grey ware high necked pot and out turned rim.

A361. Wide mouthed handmade bowl in light brown red ware.

A362. Medium sized globular spouted pot in red ware (surface worn out).

A363. Rim portion of a red slipped ware, high necked pot and out curved rim.

A364. Long spout of a grey ware pot.

A365. Rim and neck portion of a miniature pot in black slipped ware.

A367. Rim portion of a black and red ware bowl.

A369. Globular bowl in light red coloured slipped ware with grey paintings on the exterior.

A372. Sherd of a thin sectioned black and red ware bowl.

A377. Rim portion of a medium fine bowl in black slipped ware.

A378. Sherd of a high necked pot in red slipped ware with light brown painting on the shoulder and the internal surface of the rim.

A379. Rim portion of a wide shallow bowl in fine black slipped ware.

A381. Rim portion of a slipped concave neck pot with red on the exterior and black on the interior.

A387. Rim portion of a thick sectioned black and red ware bowl.

A393. Sherd of a straight sided shallow bowl in black and red ware.

A394. Ill-fired red slipped ware with painting in grey.

CHAPTER 5

Use-wear Analysis of Ground Stone Tools

Introduction

For a lithic analyst, the thirst to know how a prehistoric tools were used, and efforts to connect with past human behaviour forms an important step in lithic investigations. For over 100 years, scholars have pondered on the quest to know the functions of stone tools. In the "past two decades use wear analysis has emerged as one of the principal methods of interpreting the functions of stone tools, with Semenov's pioneering studies titled *Prehistoric Technology*, published in 1964,"[1] in which ground stone tools were examined using microscope and experimental tools investigations. Semenov identified three kinds of wear traces; striations, edge damage and polishes,[2] to infer tool functions. In the 1970's Keeley developed a new technique called high power approach using "incident-light metallurgical microscope."[3] This technique was primarily based on the identification of micro polishes on the working edges, which according to him, "the high power method, allows, not only to distinguish the degree of hardness of the worked material, but at the same time identify the specific worked materials (wood, bone, hide etc)."[4] In the 1980's there arose a debate between the

[1] Richard W. Yerkes and P. Nick Kardulia, "Recent Developments in the Analysis of Lithic Artifacts," *Journal of Archaeological Research* 1, no. 2 (1993): 100.

[2] Ibid.

[3] Ibid., 102.

[4] Joao Marreiros et al., "Macro and Micro Evidences from the Past: The State of the Art of Archaeological Use-Wear Studies," in *Use-Wear and residue Analysis in Archaeology,* ed. Joao Marreiros et al. (New York: Springer, 2015), 9.

adherents of low and high power methods on the benefits of their approach, and in the 1990's the analysts agreed that each approach had advantages and disadvantages of its own and the combination of both methods provides an integrated methodology to address the question being investigated. In the recent years, though, the goals of the use-wear analysis have remained unchanged new methodologies coupled with new technological techniques and variables have developed gradually to investigate the tools use.

The present study is an attempt to conduct use-wear analyses on the ground stone tools using stereo microscope to determine the tool use. To address the issue one of the method employed has been to examine the tool surfaces and identify wear traces, particularly near the edges, that can yield clues as to how they were used and on what materials. Furthermore, typological analysis are employed to ensure a comparable results with use wear traces examination to determine, if there is any correspondence between the two or any deviations in the use of assumed tool use. According to Semenov, to know the function or use of a tool, typology assumes an important role, and thus combined together, allows a broad and complete interpretation of the tool use by prehistoric humans.[5] The microscopic method differs from the typological analysis, which principally involves an analysis of a set of tool variables, thus enabling to identify and clarify the misleading typologies about the tool's actual use. However, no method of studying use-wear ensures correct identification of tool use, so all identifications have to be accepted as approximations rather than well-established facts. As "functional attribution based on simple analytical description with no direct evidences of use was erroneous."[6] The approach to use-wear

[5] Joao Marreiros et al., "Macro and Micro Evidences from the Past: The State of the Art of Archaeological Use-Wear Studies," 7.

[6] Ibid.

analysis in the present study is taken with a focus on the visible edge damage on the microscopic examination. This is done with the hope to arrive at a systematic study of the tool edges, the patterns of use-wear, which seeks to answer the chief question: What was the tool's use?

Methodology

The main intent on the analysis of ground stone tools of the present collection is based on the assumption that the microscopic examination will provide recognizable patterns of use-wear and it is hoped that the conclusions reached through the analysis may also help to precisely focus future research endeavours. To be noted, the study is not designed to make assured statements, but as approximation as allowed by the data. As there are multiple approaches and methods involved in determining the wear traces an analyst wished to look into, there is always the possibility that an evidence identified by scientific tools may provide satisfactory answers to a large extent.

The microscopic studies were performed at the Microscope facility laboratory of the Department of Plant sciences, University of Hyderabad.[7] The wear traces were examined with the equipment of a Leica M165FC Stereo Microscope with 7-120 magnification capability. The large range 16.5:1 zoom with the ability to structure down to 1.1 micron enabled to examine each artefacts to the tiniest detail from 2mm to 5 mm. All images were processed using a Leica DFC550 a high quality resolution with 12.5 megapixel to enhance details and to improve visual contrast. The LAS 4:2.0 (Leica Application Suite) was used to capture, process and save all the images.

Prior to microscopic analysis, the tools were rinsed with water using a gentle brush to remove any residues that may cover use traces. The artefacts were not

[7] I would like to thank Prof. late. K. Seshagiri Rao and Vinu of the Department of Plant Sciences, University of Hyderabad, for their help and assistance in operating the equipment during this study.

subjected to any chemical cleaning beyond the use of water, as it is believed that cleaning the artefacts in this way would not alter any behavioural meaningful features, as previously all the artefacts had been extensively handled and was generally found sufficient for the analysis. The analysis included various observation and recording techniques to cover the large range of relevant attributes of each individual tool. There is no single diagnostic feature, but a set of features that have to be considered in order to identify the probability of the tool use. The method used in the present study examined three variables striations, scarring and polish. Based on the variables, a suggested function and worked material is then proposed according to the sets of observation. The observations are generated from the wear traces, seen as the most significant controlling factors in determining the tools actual use. Furthermore, other variables were also considered from the sets rather than single variable wherever possible.

The first step of the analysis was to identify the existence of wear traces. This was done through the examination of each tool under a microscope using a 7-25X magnification. Keeping in mind the fact that a tool may exhibit evidence of more than one attribute, both dorsal and ventral sides of the edge were also examined. After recording the area of wear traces, the cutting edge or working edge was further examined for presence of attributes that may suggest a particular function of tool use. Later, a preliminary assumption was applied to tool use by corresponding wear traces revealed in micrographs with the typological description analysis. The micrograph size was determined by a micrometer disk scale at 2mm-5mm respectively. Taking small scale micrometer allows for a more detailed image production for tiny indents. The assumed intentional wear traces were saved in digital format.

A total of thirty three (33) specimens were selected for the analysis. The selected specimens for present analysis are ground stone tools comprising axe, celt, adze and chisel subtypes. These selected sample tools are made of a single rock type dolerite representing the local available raw materials. The specimens chosen were not restricted to a specific site, but from the total assemblages in considering the characteristics or traits revealed in morphological level. Each artefacts information was recorded by filling in a coding sheet. This contained the reference number of a tool, type, and its raw material. Based on the images generated from micrographs a descriptive data was recorded for each artefacts examined. Taking into consideration the relevant traits evident from the description, a set of variables were observed and recorded to determine the possible function of the tool.

Striations

Striations as defined by Semenov are "linear grooves that occur in the tool surface resulting from the abrasive contact between the tool and the worked material or abrasive material on one or both surface."[8] Based on the appearance two types of striations: linear or vertical and horizontal grooves are recorded.

Scarring

Scarring or microchipping is used as synonym for frequent damage. It refers to small stone particles that are removed from the edge due to a given cause.[9] The importance of these types of wear traces allow the determination of edge damage resulting from tool use in specific tasks. The patterned scarring is recorded according to the

[8] Joao Marreiros et al, "Macro and Micro Evidences from the Past: The State of the Art of Archaeological Use-Wear Studies," 14.

[9] Veerle Rots, "Wear Traces and the Interpretation of Stone Tools," *Journal of Field archaeology* 30, no.1 (2005):62.

distribution and location. Accordingly, the recorded traces are classified into a set of variables as the cause of specific movements and results of specific activity. Also, the number of scarring or microchipping evident on a tool are recorded to eliminate the worked material.

Other variables

Two variables were recorded, appearance of polish and blunted edge. The presence or formation of polish are essential in determining the motions and worked material of a tool. The visible blunted edge may add to the secondary use of a tool.

Data Presentation

Forty one (41) artefacts were selected for microscopic studies to understand how these tools were used. Of the total, thirty three (33) artefacts were recorded with various wear traces. The wear traits observed in microscopy were recorded in separate coding sheet for further analysis. The table below summarizes the observed traces of use on a specific tool. The micrograph images obtained are maintained separately in attachment for reference.

Table 8. Microwear Observations

A. No	Type	Raw material	Use wear characteristics	Suggested function	Material worked
A7	Chisel	Dolerite	Vertical grooves suggest its use as an Axe	Cutting	Dry wood
A19	Celt	Dolerite	Linear grooves and extensive microchipping	Dressing	Stone
A22	Celt	Dolerite	Vertical scratches and microchipping about .25 mm depth	Dressing	Dry wood
A30	Axe	Dolerite	Minimal shallow vertical scratch marks	Cutting	Vegetables
A35	Axe	Dolerite	small microchipping indents	Cutting	Dry wood
A36	Celt	Dolerite	Vertical grooves and microchipping	Cutting	Dry wood
A40	Adze	Dolerite	Prominent vertical grooves and microchipping on the cutting edge	Dressing	Dry wood

A45	Celt	Dolerite	Vertical grooves and microchipping on the cutting edge	Cutting	Dry wood
A46	Adze	Dolerite	Heavy flaking on the edge	Dressing	Stone
A49	Axe	Dolerite	Absence of wear marks, except recent flake damage	Adzing	Leather
A58	Axe	Dolerite	Big flake damage on the cutting edge due to impact	Cutting	Dry wood
A62	Celt	Dolerite	Blunted edge due to use wear	Chopping	Vegetables
A63	Axe	Dolerite	Small microchipping at cutting edge	Cutting	Vegetables
A64	Axe	Dolerite	Blunted cutting edge	Chopping	Vegetables
A66	Chisel	Dolerite	Microchipping on the cutting edge and battered butt end	Carving	Dry wood
A71	Axe	Dolerite	Horizontal scratches and microchipping on the angular cutting edge	Cutting	Leather
A72	Axe	Dolerite	Fine scratches on the cutting edge, rubbing or polish on the upper mid body	Hafted	Soft plant
A73	Axe	Dolerite	Long slanting linear grooves	Cutting	Hard wood
A82	Adze	Dolerite	Superficial horizontal grooves	Cutting	Vegetables
A86	Celt	Dolerite	Straight vertical grooves, large flake damage	Cutting	Dry wood
A88	Chisel	Dolerite	Polish on both butt end as per macro examination. Absence of wear marks	Cutting	Vegetables
A89	Axe	Dolerite	Use-wear absent	Chopping	Vegetables
A95	Celt	Dolerite	Superficial linear grooves and thin microchipping	Adzing	Leather
A97	Celt	Dolerite	Microchipping at cutting edge	Cutting	Soft plant
A106	Axe	Dolerite	Superficial vertical grooves, no heavy impact evident	Cutting	Soft plant
A107	Celt	Dolerite	Horizontal and vertical polish grooves	Cutting	Soft plant
A108	Celt	Dolerite	Vertical grooves and microchipping on the cutting edge	Cutting	Dry wood
A109	Adze	Dolerite	Vertical grooves, polish on the mid body	Hafted	Dry wood
A113	Axe	Dolerite	Vertical groove and micro chipping on the cutting edge	Carving	Dry wood
A120	Axe	Dolerite	Vertical grooves and polish on the mid body	Hafted	Dry wood
A121	Celt	Dolerite	Prominent blunted edge and microchipping on butt end	Carving	Dry wood
A122	Celt	Dolerite	Microchipping on cutting edge, fake scar on butt end	Carving	Dry wood
A130	Axe	Dolerite	Slanting linear grooves and heavy microchipping	Cutting	Dry wood

Use Wear Analysis

The approach to use-wear analysis employed in this study focuses on the traces of use, specifically on edge damage or scarring, striations and other variables of polish and blunted edge to some extent. From the above data, it is noticed that wear traces varies on each tools and exhibit more than one discrete patterns of wear traces in a tool. Following the general empirical observation that any intentional use of a tool generates specific pattern of wear, a set of suggested motion of use and material worked is determined. However, the study does not attempt to make a deterministic statements but as approximations as the evidence allows. Through a combination of several variables, attributed with distinct features of traces, the following types of functions such as cutting, chopping, carving, adzing, dressing and hafted use are identified. For the study, functions are identified through the microscopic examinations of various wear patterns.

Cutting – vertical and horizontal grooves are considered as a diagnostic traits to determine cutting activity. The other wear patterns such as evidence of microchipping and flake damage is used as an indicator for the material worked with a specific tool.

Chopping – these exhibit heavy battering and blunted edge usually heavy fractures.

Carving – the wear pattern is similar to chopping and consists of microchipping on the cutting edge and battering marks on the butt, probably by stroke motion.

Dressing – these show microchipping and grooves on the cutting edge. Tools worked on soft material exhibit scratches and on hard materials show prominent vertical groves and heavy flake scars on the edge.

Hafted – bright polish located on the mid body. Tools used on hard material exhibit vertical grooves on the cutting edge and on soft material fine scratches.

Adzing – these exhibit superficial or thin microchipping. Probably employed for shaping soft material.

Classification of Worked Material

The characteristics and location of edge damage provide clues to which a tool was used or the material on which it was employed. The tools utilised in hard materials showed more striations and flake damage to the worked edge. On the other hand, soft materials produce fewer striations and flake damage.[10] Based on this, the density of the material worked is divided into two categories (Chart-5).

Soft materials – soft plant and wood (probably wet wood), vegetables, leather or hide.

Hard materials – dry wood and stone.

Functions of Tools/Tool Types

The following tool types are identified through the microscopic examination of various types of wear patterns.

Cutting tools

This type constitutes the majority with a total of seventeen (17) artefacts. The wear patterns revealed traces of possible worked material on both hard and soft material. The artefacts worked on hard material possibly dry wood, was indicated in nine artefacts (A7, A35, A36, A45, A58, A73, A86, A108 and A130). The wear traces of vertical grooves combined with micro chipping or micro flake scars at the cutting edge are considered as the determinant factor (Plate-16 & 17). The cutting edge worked on hard material (dry wood and stone) exhibits greater amount of striations as the material being worked becomes harder.[11] Materials like hard dry wood and stone are

[10] William Andrefsky, Jr, *Lithics: Macroscopic Approaches to Analysis,* second edition (U.K: Cambridge University Press, 2005), 198.

[11] Ibid., 198.

highly resistant which result in the scars forming fairly quickly. On the other hand, the tools worked soft materials like plants, vegetables, leather or hide exhibit scars generally small in size, micro flaking not common and with superficial or absence of striations. This results as the worked material is soft and not resistant unlike the hard material. The eight (8) artefacts, (A30, A63, A71, A82, A88, A97, A106 and A107) worked on the soft material revealed wear traces of fine scratches, superficial grooves and thin microchipping (Plate-18 & 19).

Chopping tools

This constitutes only a minor collection of three artefacts (A62, A64, and A89). These artefacts exhibit blunted cutting edge. They were possibly used on soft materials (Plate-20).

Carving tools

These include four artefacts (A66, A113, A121 and A122) with wear traces of microchipping on the cutting edge and blunted butt end with flake scars suggestive of hammering (Plate-21). These were used as chisels for carving wood as indicated by the blunted butt probably stroked by wooden hammer rather than stone as no heavy impact is evident except minor flake scars. These were probably used on hard material like dry wood.

Dressing tools

These artefacts (A19, A22, A40, and A46) show prominent vertical grooves and microchipping on the cutting edge. These were used as adzes for dressing wood and on those worked on stone exhibit heavy flaking showing evidence of heavy impact (Plate-22).

Adzing

These include two axes (A49 and A95) made of dolerite stone (Plate-20). The artefacts do not appear to have been used as an axe, rather the curved shape of the cutting edge show thin microchipping and superficial linear grooves associated with adzing on soft material, probably leather working.

Hafted tools

Three artefacts (A72, A109 and A120) demonstrated evidence of hafting. The hafting traces consists of polish or rubbing on the mid body and fine vertical scars on the cutting edge. These associations has been defined by Rots, as "an important attribute and provide a strong argument in view of hafting."[12] The presence of vertical scars on the cutting edge indicates its use as an axe for cutting wood, however the absence of chipping on the artefacts suggests processing of softer wood material.

In summary, all thirty three (33) selected sample showed diagnostic evidence of use. A great number of activities were indicated with plant cutting (soft and hard), while chopping, carving and dressing were also present. Besides, three (3) of the tools were hafted and six (6) tools were identified as multifunctional tools.

Typology and Microwear

The lithic analyses are heavily reliant on the use of typology based on tool morphology. This groupings of artefacts in an assemblage no doubt make the variability easier to interpret for the lithic analysts. However, "these typological study remain to be accepted only as a preliminary step towards other studies"[13] with emerging trends in archaeological investigations. Yet there remain questions like

[12] Veerle Rots, "Keys to the Identification of Prehension and Hafting Traces," *in Use-Wear and residue Analysis in Archaeology,* ed. Joao Marreiros et al. (New York: Springer, 2015), 100.

[13] D. Cahen et al., "Stone tools, Toolkits, and Human Behaviour in Prehistory," *Current Anthropology* 2, no. 4 (1979):661.

"whether or not these typological classifications are reliable indicators of how such tools were actually used."[14] As stated earlier that one goal of the present use-wear analysis was to determine the correlation between typology and the assumed use of tools generated from micro examination or to see if there are any signification indications of deviations between the two studies. In the case with present use-wear samples, with the exception of few tools the inferred use of tools based on microscopic examination is found consistent with typology. For instance, axes predominantly were used to cut, chisels for carving, adze for splitting and dressing.

The individual artefacts with wear traces results that coincide with the assumed typology use are six (6) artefacts in total (Plate-23). Despite this small sample size, the results proved to be significant in view of multifunctional use of the tools. Three celts made of dolerite showed multiple uses. Artefact A95 is a small miniature celt whose butt end is missing, possibly due to an impact fracture. The sharp and curved cutting edge combined with the presence of thin microchipping and superficial grooves indicates the tool was used as adze i.e., cut, dressing, and or scrape, leather or similar soft material. Artefact A121 and A122 are miniature celts with thin flat body. Wear traces suggest their use as chisel is indicated by presence of microchipping and flake scars on the cutting edge. Additional evidence for chiselling was observed through considerable chipping on the butt end. The possibility of which it was stroked by a wooden hammer as there is no evidence of battering marks by hard material like stone. One rectangular axe, (Artefact A113) is a rectangular axe, with extensive battering marks which is reduced to complete blunting on the broader side. The vertical grooves with micro chipping confined to the narrow side of the rounded

[14] William Banks, "Toolkit Structure and Site Use: Results of a High Power Use-Wear Analysis of Lithic Assemblage from Solutre, France," (PhD Thesis., University of Kansas, 1996).

cutting edge indicates its use on wood in carving motion as a chisel. The axe A49 exhibits thin microchipping along the semi-circular cutting edge indicating that it was used as an adze on softer material, probably leather work. Artefact A7 is an example of a chisel being used as an axe. The vertical grooves to the cutting edge is suggestive of wood cutting. Perhaps the blunted edge was deemed not useful for its original function and it continued to be used as an axe. The above stated small sample in a way demonstrates that "artefact form does not correlate with its use in all cases."[15] Traditional typology imply tool use inferred by the morphology of the tool. For instance, axes were believed to be used for cutting and not necessarily anything else, similarly chisels, adze for the assumed use and not for any other. However, these sample analysis show that the artefacts perform the purpose as specialized tools at least most of the time, but that they were also used for several other activities as well. It is also probable that they might have been used or worked on more than one kind of material.

Functional Interpretation

Materials and Functions

All of the selected samples examined showed microscopic evidence of use. Although these are inadequate representation of the total amount of used artefacts in the present study, it is believed that the results of the selected samples from micro examination would provide a significant interpretation of use wear pattern and tool use. The thirty three samples (33) selected were all edge tools that showed traces of use in different specific pattern.

[15] William Andrefsky, Jr, *Lithics: Macroscopic Approaches to Analysis*, 203.

On the material worked both soft and hard material were found consistent except for a minor difference. Hard materials were worked most often with a total of seventeen (17) artefacts. The hard material here refers to hard dry wood and stone. The edges utilized on hard material exhibit wear traces with large micro flake scars combined with grooves. Work on soft material was evident from fifteen (15) artefacts. The wear traces consists of materials worked on soft plant and wood, vegetables, leather or hide etc., (Chart-5). This showed traces of superficial and shallow scratch marks and the scars generally small in size.

The chief function of cutting was evident in seventeen (17) tools, followed by carving four (4) tools, chopping three (3) tools, dressing four (4) and adzing two (2) respectively (Chart-4). Cutting is evident on both soft and hard materials, i.e., soft plant, vegetables and dry wood. Chopping and adzing was associated with soft material. However, this kind of activities were more indicative of domestic purpose. The actions of carving and dressing was restricted to hard materials probably dry wood, generally used as chisels and adzes. The multifunctional tools termed here as "varied actions" suggest how the tools were used for different actions on the same material or of similar type actions on the same material. This also demonstrates how the Neolithic people of the study region could perform varied activities and were well adapt at use of tool before its complete exhaustion. This also points to a behavioural changes in tool use, indicating secondary applications of tools when due to breakage, they were not suitable for primary function they were designed for.

Conclusion

The major point that emerges from the present analysis of micro examination is the occurrence of activities indicated with plant cutting. The wear traces acquired from sample directs these mostly towards processing food and general domestic activities. Such distribution of activities suggest a specific type of subsistence or changes in subsistence strategies depending on plant resources. The ratio of ground stone tool confined to cutting (axes and adzes), chopping and hafted implements suggest a more sedentary or semi-sedentary communities. This is further attested by the association of raw material selection of the tool. All the tool samples of micro examination in the present study are entirely made of dolerite. The reasons for preferential selection of raw material could be due to the abundance of locally available raw material and also the easy flaking the ease with which this raw material can be moulded for specific task activities. Further dolerite is a hard material, but at the same time softer than granite. Hence it could be grounded well into shape on the granite rocks, which abound this region. At almost all the Neolithic sites in this region, grinding grooves, known as cup marks were noticed in good number (Plate-24). If the selection was based merely on physical attributes then, the statement is a clear indication of the selection intended towards tool function. These changes are indicative of advancement in technology and subsistence where man learnt the art of controlling the surrounding environment and exploiting its resources.

In summary, this small pilot study did answered the posed question of the analysis. On the use of tools, it indicates the Neolithic inhabitants of the study area immense use for cutting tools, with wood and plant working. The reasons could be location of site nearby abundant plant resources or shift in subsistence strategies, indicating a sedentary community. It is well established fact that the Neolithic folk

were agro-pastoral community. Agriculture required clearing the land of big and small vegetation. Further periodic seasonal operation were required for clearing the land. Since, they settled in village communities with closely spaced hutments, large amount of bamboo, sticks and leaves were required for their houses. For the agricultural implements also they must have required to cut wood. All these operations indicate regular working on the wood and plant remains. The present analysis clearly suggests such activities, and helps us in having a glance of the life and daily activities of the Neolithic folk. Further examination of artefacts from other areas, may provide more insight on this issue. The examination also demonstrates that ground stone tools had multiple uses. The stated question of correlation between typology and micro wear results also demonstrates, that these two are found closely related. However, the artefact sample though small in size, is the first study from the present research region to be subjected to use-wear analysis, and thus we cannot generalize these results to other assemblages. More in-depth studies are needed to reveal the interpretation of tool use and activity patterns. The interpretations on the sample are made to the level that the evidence allows and are not exhaustive. In this respect, it is believed the present study served the purpose of the stated goals on the use of tools and should be considered as an example of multi-dimensional approach in the interpretation of tool use.

MICROWEAR PATTERNS

The selected sample of thirty three (33) tools of the wear traces as evident from microscopic examination are discussed below:

A7. The tool seems to have been used initially as a chisel as suggested by the flaking on the cutting edge and battering marks on the butt end, which got blunted. The vertical grooves which are ‘post-chipping’ suggest its continued use as an axe, once they found not useful as a chisel.

A19. The edge shows both extensive linear grooves as well as extensive chipping. Micro examination reveals the chipping as post-groove formation. It is apparent that the tool was initially used as an axe on wood. Later they seem to have used it on harder surface like stone (pecking?) which resulted in heavy flaking.

A22. The tool is having straight vertical scratches and micro chipping at edges having less than .25 mm depth, suggests its use as a finishing tool, probably in dressing wood.

A30. The well preserved tool does not have much wear or scratch marks. Only occasional shallow vertical scratches suggest its use as an axe, though the tool seems to have been employed for a very short time.

A35. The tool having a slightly curved cutting edge has small chipping indents suggesting its use on harder material like wood. The small size of the indents suggest application of lesser force indicating its use as a tool in the finishing process.

A36. Combined chip wear and scratch marks revealed from micro photos suggest its use on hard material like wood. The small size of the chipping suggests its use as a finishing tool.

A40. The tool having a plano-convex longitudinal profile must have been used as an adze for dressing wood as suggested by the vertical grooves and chipping on the cutting edge.

A45. The tool has both vertical grooves as well as small chipping, suggesting its use as an axe.

A46. Though the cutting edge is heavily flaked, it does not reveal any linear grooves. The curved nature of the body suggests its use as an adze initially. Later, it seems to have been employed in dressing the stone material as suggested by heavy flaking.

A49. Ignoring the evidently, recent flake damage, the surface of the cutting edge does not have linear grooves, ruling out the possibility of its use as an axe. The semi-circular cutting edge might indicate its use as a cobbler's adze, which must have been used on softer material, supporting the absence of linear grooves.

A58. Big flake damage evident in micro photos suggest its use as an axe.

A62. The tool having a very straight cutting edge does not reveal any chipping, but only blunting of the edge due to use-wear. The tool was probably employed for domestic purpose in processing softer material like vegetables.

A63. The tool broken at the upper half having almost pristine cutting edge with occasional flaking, without linear grooving might suggest its early breakage. The small flaking might suggest its use on soft materials.

A64. The blunted cutting edge without linear grooves might suggest its use in domestic or artisan purpose.

A66. The sharp cutting edge having small flake damage, combined with battered butt end and the slender and small size of the tool indicate it as a chisel.

A71. The tool having overall smooth surface is suggestive of hand held use. The curved and transversely angular cutting edge revealing only the horizontal scratches

suggests preservation of the grinding marks. Micro chipping evident in the micro photos viewed combined with angular cutting edge suggest its use for leather cutting or other softer material by swinging the tool rather than by stroking.

A72. The heavy (778 gm) pointed butt tool having fine polish on the cutting edge revealed fine scratches, but not much chipping on microscopic examination. The upper mid body has transverse indent with rubbing evidence suggesting hafting to a handle. The fine scratches suggest its use on wood, but the absence of chipping suggests its probable use by a craftsman rather than by a wood cutter.

A73. The sturdy tool with near round mid body has a very smooth polish on one side, whereas most cutting edge of the other side is flaked off. The micro wear examination shows lengthy, slanting linear grooves suggesting its definite use for wood cutting.

A82. The medium sized tool with slender, smooth well preserved cutting edge is suggestive of its use on very soft material, probably in domestic sector. The micro wear examination reveals horizontal grooving, which must have occurred when the tool was ground and polished.

A86. The straight vertical grooves combined with large flake damage indicates its use as an axe.

A88. The almond shaped miniature tool has flat surface on one side and roundish bulge on the other side giving it a plano-convex profile. The cutting edge is flat, sharp and well preserved. The micro examination does not reveal any wear marks. Both sides of the butt end has smooth wear polish. All these characteristics suggest its use in domestic sector for processing soft material.

A89. The thin bodied celt showing no vertical grooves and relatively pristine cutting edge suggests its use in domestic chores.

A95. Very light chipping and superficial linear grooves combined with the curved shape of the tool suggest its use as an adze.

A97. The cutting edge straight, well preserved and smoothly polished on both sides. No evidence of hafting. Micro examination does not reveal any scar marks except small chipping. The tool seems to have been used in domestic sector.

A106. The cutting edge of the axe is very sharp and well preserved, showing very superficial vertical grooves suggesting its use on softer wood probably by an artisan. No heavy stroking is evident.

A107. The thin flat tool has straight cutting edge, which is nicely polished on both sides. The cutting edge well preserved except one small flake damage. The micro examination reveals both the horizontal polish grooves and also the occasional vertical grooves. The tool seems to have been used for moderate tasks, probably by an artisan.

A108. The slender bodied, near rectangular celt shows both vertical grooves as well as chipping on the cutting edge, suggesting its use as a cutting tool for wood or similar material by an artisan.

A109. The plano-convex profile tool has round, smooth, well-polished cutting edge, which has extensive small flake scar damage and a single big flake off. On the flat side in the mid body there is wear marks suggesting its transverse hafting to a handle indicating its use as an adze. The tool seems to have been used on softer wood, as vertical scars are noted in micro examination.

A113. The near rectangular tool has polish on both ends, but the broader size is extensively battered, resulting in complete blunting. Very interestingly, the narrow side which has rounded cutting edge reveals vertical grooving and micro chipping. The tool seems to have been used as a chisel.

A120. The tool has a smooth polished cutting edge on both sides. The mid body has smoothening suggesting its hafting. The vertical scars suggest its use as an axe.

A121. The slender bodied miniature celt has the cutting edge worn off due to small and large flaking and considerable chipping on butt and suggesting its use as a chisel stroked by a wooden hammer.

A122. The miniature celt with thin flat body was employed as a chisel, as suggested by the micro chipping on the cutting edge and also by the flaking on the butt end which must have resulted due to battering by a wooden hammer. (Include complete photos also)

A130. Heavy and intensive chipping combined with slanting linear grooves suggest its use as an axe.

CHAPTER 6

Documentation and Analysis of Rock Art

Introduction

The "man-made markings on rock surfaces"[1] known as 'rock art' which includes the simplest manifestations, even like the scratching of a meandering line or two found on rocks is quite diverse. Such art is a great source of information in understanding the human past and cultural practices in the form of artistic expression. It is a global phenomenon, which led to inquiries into human past that can be studied, preserved and valued through these depictions. What is depicted is considered as a vital source that reveals Man's nature not deductible from his material evidences.[2] This, presents us with a world of images of the archaic expressions of human societies as well as their culture and traditions.

In India, the discovery of rock art from Sohaighat, Mirzapur district, by Archibald Carllyle in the year 1867,[3] is the earliest mention of rock art in the continent. Although, rock art was discovered in India long before the Franco-Cantabrain rock art in Europe it received little attention with sporadic reporting or not well informed.[4] The discovery of Bhimbetka in 1970's and the excavation in Auditorium Cave by Wakankar

[1] Robert G. Bednarik*, Rock Art Science: The Scientific Study of Palaeoart* (Belgium: Brepols, 2001), 202.

[2] A. R. Willcox, *The Rock Art of Africa* (London: Croom Helm, 1984), 7.

[3] E. Neumayer*, Lines on Stone: The Prehistoric Rock Art of India* (New Delhi: Manohar, 1993), 7.

[4] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis,* IGNCA Rock Art Series – 7 (New Delhi: Aryan Books International, 2013), 148.

and Misra was able to credit India as the oldest known rock art in the world context.[5] This marked the beginning of the systematic study of rock art, wherein subsequently many rock art sites were discovered in different parts of India. They are widely distributed in diverse geographic regions of the subcontinent across Vindhyan region, eastern part and in peninsular India with rich prehistoric rock art.[6]

Rock Art in Andhra Pradesh

The region of Andhra Pradesh, also accounts for the presence of rock art tradition as early as Mesolithic to Early Historic period. The rock art research began much later in the middle of 20th century, where the earliest rock paintings were reported in 1941,[7] from Sanganonipalli and Dupatagattau. The report though a brief account with lack of details of the depictions in the paintings, no doubt, paved the idea of prehistoric evidence and of rock art in the region. Since then, it began to attract a number of scholars and researchers, who then contributed to discovery of considerable number of rock art sites. In the following years from 1959 - 1993 the State Department of Archaeology and Archaeological Survey of India brought in their periodical Annual Reports, the discovery of more rock art sites. In 1968 Rami Reddy, as part of his doctoral research discussed on the Neolithic rock art of the region.[8] A continuation of research is seen in the works of Krishna Sastry, "*The Proto and Early Historical Cultures of Andhra Pradesh"* who discussed of the then know rock art sites in brief.[9] Although he delineated the rock art into Neolithic, Megalithic and Early historical

[5] Bednarik, *Rock Art science: The Scientific Study of Palaeoart*, 90.

[6] E. Neumayer, *Lines on Stone: The Prehistoric Rock Art of India* (New Delhi: Manohar, 1993), 13.

[7] Krishna Murthy, "Geology of parts of Mahbubnagar and Gulbarga districts," *Journal of Hyderabad Geological Survey* 4, no. 1 (1941): 88.

[8] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis*, 23.

[9] V. V. Krishna Sastry, *The Proto and Early Historical Cultures of Andhra Pradesh,* Archaeological Series 58, (Hyderabad: The Government of Andhra Pradesh, 1983), 46-48.

phases, there was dearth of information, and the study was not intensive. Thereafter, individual discoveries are reported occasionally in papers, for instance, "Ramabrahmam discovered a rock art site in Kadapa," "Venkata Subbaiah at Veprala in Anantapur," according to the discoverer both sites belonged to Megalithic phase.[10] In the recent years, more systematic approaches to the study of rock art is seen in the work of James Blinkhorn et al. at Kurnool rock art sites integrating landscape approaches to understand the rock art imagery,[11] and in 2008 Chandramouli, conducted a systematic documentation of the Andhra Pradesh rock art, based on ecological context of each site and framed a tentative chronology that range from Mesolithic to the Historical period. The publication which appeared under IGNCA Rock art series, "*Rock Art of Andhra Pradesh: A New Synthesis*," in 2013, which reports a total of 38 rock art sites from the region. The sites known are not comprehensive and it is likely that the number will increase, if we include the unreported sites.

Coming to study area, the study of rock art has been overlooked and has not been used to understand the rock art practices in general. As known at present, except for the study of the rock art by Chandramouli, no attempt has been made to comprehensively study the known rock art sites. The meagre information on rock art in, not to mention the unavailability of written material on, the study area, the present investigation was conducted focussed on the identification of rock art. The earlier reported sites were revisited and an attempt was made for proper documentation.

[10] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis*, 24.

[11] James Blinkhorn, "Rock Art Research in India: Historical approaches and Recent Theoretical Directions," in *A Companion of Rock Art*, ed. Jo McDonald et al. (U K: Blackwell, 2012), 191, PDF e-book.

Documentation of Rock art sites of the study area

The chapter on rock art is an outcome of the exploration carried out in the study area. In the undertaking of investigation 8 sites namely, Budagavi, Velpumadugu, Katamadevudu, Karakamukkala, Bukkaracherla, Narasanayunikunta, Chinnakonda and Peddakonda are found to contain rock art depictions. The former two rock art sites are reported earlier and the latter rock art sites are discovered in the present investigation. It is to be kept in mind that the claim is not regarding the discovery of the sites but only the rock depictions, which I supposed the earlier investigators have missed or it could be that the sites remained unreported as is seen in many cases. For instance, Budagavi was first discovered by Foote and then by Rami Reddy, but surprisingly both the investigators failed to notice the rock depictions. It was Chandramouli who brought to attention of the said rock paintings, and again of Velpumadugu the first discoverer Reddy, mentions only of bruising of a pair of humped bulls and so is Chandramouli. Both, failed to notice the other three bull bruising's[12] as was noticed in the present investigation. By keeping these aspects in mind, the present investigation was undertaken with a prime focus to document the rock art depiction of the images, type or technique in the execution. A thorough detailed description on spatial settings i.e., location data with geo coordinates, elevation from MSL and evidence of other archaeological remains were documented. An attempt was also made to note the proximity of natural resources like water source and soil type etc. This was done with an aim to see if there was any link or significance in the choice of location.

[12] The present depictions (two bulls) are noticed on a huge boulder adjacent to Rami Reddy discovery facing south direction and a solitary bull is found towards south-west on a boulder below a shrine called *'Munishwaradu'*.

The rock art sites under investigation are located at an altitude ranging from about 490 to 545 m, MSL. They occur in the geological zone of archaean - granitic gneiss and are traversed by trap dykes of great size and length, often forming into distinct hills, a striking feature of the landscape. They are noticed in the rugged terrain of hilltops and hillocks overlooking the plain below. The rock art sites are found near water sources especially perennial steams and springs, the fact on priori grounds that the study area is concentrated on regions watered by Hagari and Pennar river system. With regard to archaeological remains, Neolithic habitations were also found at the foot of the hills at Budagavi, Katamadevudu,[13] and on top of hill at Velpumadugu rock art site.[14]

Content of the Rock Art

On the basis of technique of depiction, rock art can be classified into two types respectively:

1. Pictograph - a technique that involves the application of colour substance to the rock surface.[15]
2. Petroglyph – "a technique that involved a reductive process in its production, such as percussion or abrasion."[16]
    a. Bruising – "a rock marking produced by light direct percussion, through removal of particles from the rock surface."[17]

[13] Now major portion of the habitation remains at Budagavi and Katamadevudu lies in the cultivated field.

[14] On the association of settlements and rock art, Bruce Foote is credited for the earliest account on his work *Prehistoric Antiquities.* Later, Allchin's excavation at Piklihal also supported the view by discovery of rock art in relation to the Neolithic sites. Neumayer, *Lines on Stone: The Prehistoric Rock Art of India*, also supports the view of its presence near to settlements in Deccan.

[15] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis*, v.

[16] Bednarik, *Rock art Science*: *The scientific study of Palaeoart*, 200.

[17] Ibid., 194.

b. Engraving – "a marking produced by a process of abrasion,"[18] these are shallow design cut into surface of rock.

The rock art of the study area is dominated by petroglyphs mostly rock bruisings, depicted on the surface of granite boulders. Out of 8 mentioned sites, 7 sites (Velpumadugu, Chinnakonda, Peddakonda, Katamadevudu, Karakamukkala, Bukkacherla and Narasanayunikunta), were confined to rock bruisings and only one site Budagavi was noticed with pictograph of red ochre paintings. Petroglyphs are found in open rock boulders while pictograph found in the shelters on the rock face. The rare occurrence of pictographs maybe due to "taphonomic"[19] factors of the study area, as mentioned in Chapter – 2. The view is also supported by Allchin[20] and Neumayer,[21] suggesting the preference of quartzite rock, where paintings were done in protected surfaces and in rock shelters free from weathering, the obvious reason being the durability of the pigments. One of the most common problem highlighted by the research on rock art is the problem of its dating,[22] and the study area stands no different. Keeping this in mind, the chapter intends to provide a basic step to understanding of the rock art images by recording each motifs to record the visual aspects of the art. Bednarik writes, "Recording of rock art is a multi-faceted subject and diverse in regional practices and individual preferences. Each methods has its own strength and drawbacks; a variety of factors determine the choice, a rock art recorder adopts as a

[18] Ibid., 196.

[19] Nicole Boivin, "Rock art and rock music: Petroglyphs of the South Indian Neolithic," *Antiquity,* no.78 (2004):42, https://www.cambridge.org/core/services/aop-cambridge-core/content/view/S0003598X00092917.pdf.

[20] F. R. Allchin, *Piklihal Excavations* (Hyderabad: Government of Andhra Pradesh, 1960), 13.

[21] E. Neumayer, *Lines on Stone: The Prehistoric Rock Art of India,* 30.

[22] Nicole Boivin, "Rock art and rock music: Petroglyphs of the South Indian Neolithic," 38.

method which yields worthwhile results."[23] To understand the rock art images better photographic recording was done using digital camera, with the hope that photographs may reveal more information than observed by a human eye. After this, a transparent sheet was used to trace the motifs from the photographic records. This proved effective for detail recording of the petroglyphs figures in certain cases, as the depictions are a mixture of well delineated patterns as well as very faint lines. Tracing helped in bringing out those very faint lines.

Analysis of Rock Art

For convenience and better understanding of the rock art, motifs of petroglyph and pictograph are described separately. The illustrated paintings and bruisings are indicated with code 'D' standing for Drawing. Further, instead of describing the motifs of each site individually, a broad characteristic features are identified to group the subject matter. The subject matter (petroglyphs and pictograph) of rock art of the study is grouped under the followings headings:

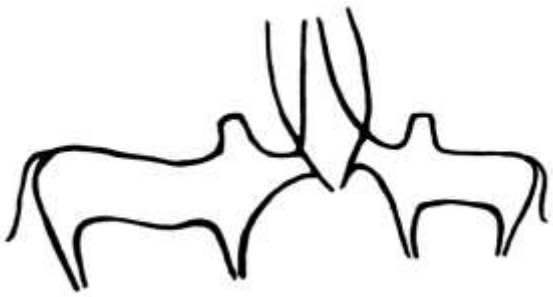
Petroglyphs

Animal figures

Animal figures are represented mainly by the figures of cattle being the subject matter of the pictures. A total of 10 such figures were noticed bruised on the boulders. In most cases they appear as a single individual figure and rarely with multiples of two in few sites. The 'humped bull' is frequently depicted figure in bruisings, outnumbering the 'bovids' without humps with a total of seven (7) figures found at Budagavi, Bukkacherla, Chinnakonda, Peddakonda and Velpumadugu. One of the best humped bull depiction is attested in bruising of Velpumadugu, where a pair of humped bull

[23] Bednarik, *Rock art Science*: *The scientific study of Palaeoart*, 55-56.

facing each other on a huge granite boulder is depicted (D.6.1). The artist seems to have taken care of every minute detail, portraying a whole naturalistic bull. The bulls have long and slightly curved horns having same length, the artistic degree of fineness hard to find in bruisings of other figures. The front and hind legs, slightly curved tails and the hump are drawn with great elegance in thin line visible even from far. Though similar specimens have been reported from "Piklihal and Sanganakallu, it differs in varying degree with absence of trifurcation (three pongs) of horns and no crossing of heads showing a bull fighting."[24]



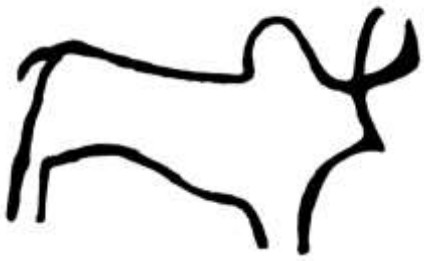
D.6.1 Humped bull bruising at Velpumadugu

Another specimen (D.6.2) from the same site near Munishwaradu shrine, is noticed a schematised bull, whose front and hind legs have partly eroded, the stone being weathered or broken in certain sections. The body of the bull is completely bruised as a block, rather than line depiction. The hump is not depicted prominently, though some elevation is shown. The only protruding section is the wide splayed 'V' shaped horns, slender body with a hanging tail. A closer look of the figure suggests that the artist was trying to depict the bull in movement.

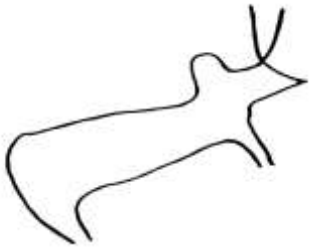
[24] N. Chandramouli, "Beginning of cattle domestication in Andhra Region: Perspectives of Rock art and Archaeology,"*Purakala,* vol.22 (2012):55.

D.6.2 A complete bruised schematised bull

The bulls at Chinnakonda (D.6.3) and Peddakonda (D.6.4) share a similarity in depiction of sharp pointed mouth; high hump and stiff body. The horns are drawn in straight ‘v’ shape with both front and hind legs shown partially. The only difference visible is the former bull shown with somewhat face downward in a thick outline while the latter is projected in slanting position with thin outline and devoid of tail. To some degree naturalism is being maintained. They were invariably depicted in movement with legs projected forward.



D.6.3 Chinnakonda



D.6.4 Peddakonda

A remarkable feature to be noted is from the site of Budagavi and Bukkacherla, where the bruised humped bull is found in close association with the geometric symbols. These are the only sites where the figures are found in association with such symbols. The bull figure at Budagavi (D.6.5), is bruised in thin line with predominant hump. The front and hind legs are bent, slanting tail suggests the bull in movement. The

horn is faintly visible almost appearing like ‘a bull without horn’ the reason could be either due to weathering of rock or the earlier figures been retouched, thereby changing the appearance of the figure. The geometric figure depicted opposite the bull is the ‘circle-with-a-trident’ found in various forms, sizes, shapes and techniques across the study region, which will be discussed separately to consider its relation with the bull figures.

D.6.5 Bruised bull in thin line, Budagavi

A solitary humped bull in isolation is noticed on a granite boulder in the vicinity (D. 6.6). It has wide splayed out long horns with low hump. The body is completely bruised as a block. Except for the rendering of naturalism in portraying the hump and the horn, the overall content is schematised of being a rectangular body, short straight tail and the legs in straight lines, with two hind legs and one front leg devoid of details.

D.6.6 Schematic bull in complete bruised rectangular body

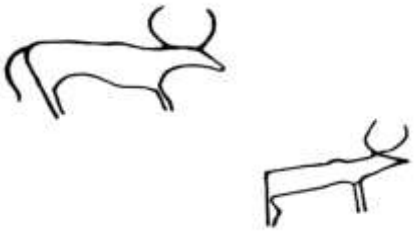
Somewhat abstract and schematic is the figure of humped bull found in close association with an abstract motif (D.6.17.b.5) in a low rock boulder at Bukkacherla (D.6.7). The bull is completely bruised with rectangular body and face looking downwards. The hump is prominently drawn, but rather positioned unnaturally. The horns are shown slightly curved and bent forward. The two hind legs, rather slender are in straight line while only one front leg is depicted. Unlike the pointed face found in other sites, the bull has wide naturalistic depiction. This could be the representation of *Bos Indicus* species and a display of schematisation.

D.6.7 Complete bruised bull in rectangular body

There are very few examples of 'bovoid' bull without hump illustrated in rock art of the study region. They are noticed only at Peddakonda and Velpumadugu sites. An interesting feature noticed is the depiction of the bull in multiples of two, where each figure is placed upright one after the other in vertical position. D.6.8, at Peddakonda is schematic in outline with absence of tail in both the figures. There is a variation in the two figures, the top figure with straight horns, pointed mouth and the body drawn with some maintenance of naturalism. Both the front and hind legs are depicted. While, the bottom figure is abstract with straight body, there is no depiction of horns. Only one front leg is shown while the hind legs are almost reduced to stick line. Both the figures are in single outline. The body of both the animals are more elongated than the natural proportion.

D.6.8 Bovine in outline at Peddakonda

At Velpumadugu, two such figures of bovine were noticed on a loose granite boulder (D.6.9). The 'bovine' placed on the top is drawn naturalistic in single outline. The horns are set wide apart curving in a 'crescent' or 'c' shape. The front leg stretched forward and one of the hind leg tucked inside show the animal in forward motion. The variability identified at former site is noticed here with the bottom figure. The figure here is abstract with rectangular body, restricted straight at the end with no tail, front and hind legs with straight stick line. It can be inferred from the above two figures, that they were drawn by an untrained artist or that they were not drawn by the same artist of that period.



D.6.9 Bovine in 'C' shape horns at Velpumadugu

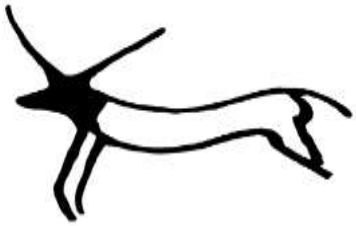
D.6.10 noticed at Peddakonda, is schematised and devoid of hump and tail. It is found in a heavily flat patinated, algae infested, loose boulder, in association with 'circle with a trident' symbol. The animal has a sharp pointed mouth, with only one front and hind legs depicted.

D.6.10 Schematic bovine at Peddakonda

Deer

After cattle figures, four sambar deer (Cervus sp.), are noticed from the sites of Katamadevudu and Chinnakonda. Three deer figures are noticed on a separate rock boulders at Katamadevudu, wherein in one of the boulders two deers are depicted in a particular order one following the other (D.6.11.a). The figures are completely bruised, the hind portion of the body faintly visible. The figures are in schematic style with stumpy hind legs and stiff body. To the right side, another boulder has a solitary deer figure facing north east (D.6.11.b). This figure is also schematically drawn with the body in strong outline with prominent tail and the head portion completely bruised. The figure conveys motion or fleeing in panic, the front legs leaping forward.

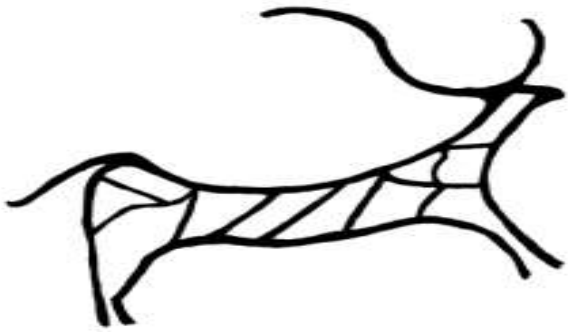
D.6.11.a Schematic bruised deer figures



D.6.11.b Deer in moving posture

Another interesting outline representation of a large-sized deer is noticed at Chinnakonda (D.6.12). The deer is highly stylised with the body filled with wavy linear cross lines. It has a long slender body and curved horns. Only a half portion of the horn is visible on one side due to a crack of the stone. The mouth is sharp pointed, with legs

leaping forward, gives the appearance of the animal in movement, which is also suggested by near horizontal tail at the back. Though the tail is longer than usual, the absence of hump suggests it as deer. The designed body is a similar representation to the red ochre deer and humped bull paintings noticed at Budagavi.

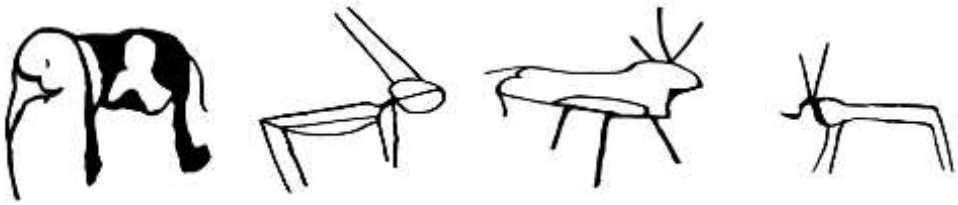


D.6.12 Deer with wavy linear cross line designs at Chinnakonda

Unidentified animal figures

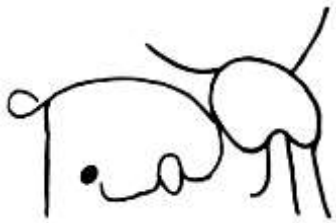
A total of five individual figures were noticed from the site of Peddakonda and Karakamukkala. Four outline figures in schematic style are noticed at Peddakonda (D.6.13). The only identifiable figure is that of an elephant with partially bruised body, stumpy front and hind legs. The trunk, tiny tail and eye are highly stylised. Overall, the figure is stiff and no attempt is evident to show realism in depiction of the figure. This figure could probably belong to a later period. The second figure, partially faded, is found depicted on a highly patinated boulder. The figure which is difficult to identify is having a highly stick-like body form, with rounded head and long straight horns, which are abnormal for its size. There is also an attempt to divide the body and head into two halves by horizontal lines. Another schematic depiction of a faint animal figure is seen close to the second figure. The figure has rounded bulging body and short tiny tail. The head and lower portion of the body is depicted with three straight lines sticking out of the body, probably indicating legs. The fourth animal figure is faintly visible with a

straight elongated body. This stiff figure has attachment of stick-like line legs. The head is not visible except a single curved line which looks like a snout. The straight 'v' shaped horns, seems to be the only characteristics of a cattle, though actual depiction could not be ascertained due to the faint nature of the surface.



D.6.13 Elephant and unidentified figures

Another solitary figure of an animal drawn in outline is noticed from Karakamukkala (D.6.14). The animal figure, visible faintly, has a bulbous body and rounded head. The tail is clearly visible with curl right at the back. The back is depicted with a straight vertical line. A very faint three lines are drawn downwards from the head. The exact identification of the figure could not be ascertained.



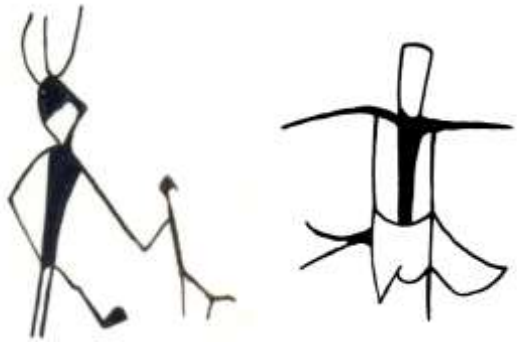
D.6.14 Unidentified figure

Human or anthropomorphic figures

The human or anthropomorphic figures have been noticed from Peddakonda site (D.6.15). The figures are found in separate boulders. In one of the heavily patinated boulder, two faintly visible figures are seen. These figures are drawn in outline. Here, two different versions are seen in the form of their bodies. The first figure is drawn in an

elongated rectangular shaped body while the other comparatively small in size is drawn in simple stick form without detailed features. An interesting feature noticed is the three vertical lines on the head on the first figure, which could be a head gear. The body posture gives the appearance of the figures standing with hand in hand, marching and looking towards a particular direction. Due to the nature of surface the actual depiction could not be discerned but the visible forms of movement probably suggest involvement of some activities like dancing.

The third human figure is schematic, stylised and drawn in combination of outline and solid fill. The figure is stiff with bulky torso. A solid vertical line in the middle of the abdomen is seen. The hands are horizontally outstretched. It lacks depiction of the legs, where a stylised 'w' shaped line is drawn indicating lower part of the body. At the waist level, an attachment depicted in solid fill in the shape of a fish tail. This could be some adornment worn by the person in the depiction.



1 2 3

D.6.15 Anthropomorphic figures with head gears and ornaments

The Non- representational art

This form of art has been a widespread occurrence well known in different regions of the world prehistoric art. It has been further described as "geometrical where the designs may take any form that can be readily described in the language of geometry. These

include all forms based on the circles, rectangles, triangles, grids, and parallel lines, wavy or zigzag lines."[25] In India this form of art commonly found in rock art, are believed, "to date from the Mesolithic, designs include the cross-in-circle, circle-and-ray, concentric circles"[26] and of rectangular forms to name among the few. An interesting, rather unique, motif is found depicted profusely at a score of sites in the study region. It has been called the "circle-with-a-trident"[27] or '*Pīrla'* symbol as is locally known. These symbols are found in variant forms, sizes, shapes and techniques in the Petroglyphs at multiple sites such as Budagavi, Chinnakonda, Karakamukkala, Narasanyunikunta and Peddakonda etc. which will be discussed separately: A total of 24 symbols were noticed, and at most sites, the symbols appear as simply one kind of motif, except some minor changes in its depiction. At times, they are found depicted along with other motifs. However, at some sites they are found independent of other motifs, assuming to have independent significance.

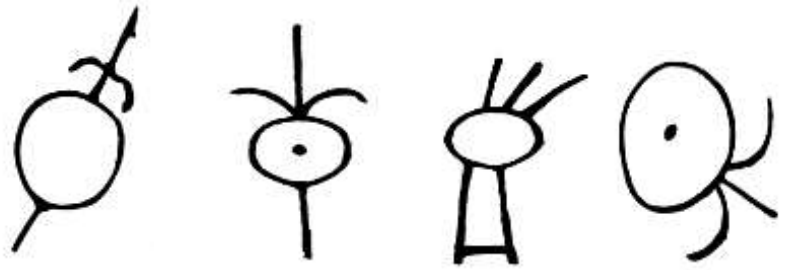
At Peddakonda, 14 such symbols were found scattered in different loose boulders. In (D.6.16.a), the first symbol is noticed on a flat boulder heavily patinated by fungus. It consists of a circle connected by a vertical lines on top and bottom with a slant angle of about 5°. It has two short horizontal bent lines attached at the top very much similar to a trident *(trisul*). This motif is bruised and the state of preservation does not indicate any sign of superimpositions. The second motif noticed on a separate boulder, is an emphasised circle with a dot in the centre. There are with two inverted lines connected to the top of the vertical line. The third, is a bruised solitary motif noticed on a flat rocky surface which is heavily patinated. The motif comprised of a rounded circle joined by two vertical lines connected by a horizontal line at the bottom,

[25] A. R. Willcox, *The Rock Art of Africa,* 12.

[26] Ibid., 239.

[27] N. Chandramouli*, Rock Art of Andhra Pradesh: A New synthesis*, 90.

which looks like a stand. At the top are also seen three vertical lines slanting towards right. The intended depiction of the motif is not clear. The fourth motif is noticed a few yards away in the same vicinity on a flat rock surface. It has a rounded circle with a dot in the centre, connected by a vertical line and two curved lines on either side of this straight line at the bottom. The motif is unique, that the horizontal lines are attached at the bottom and is surprisingly engraved. The execution must have done with a strong heavy tool.

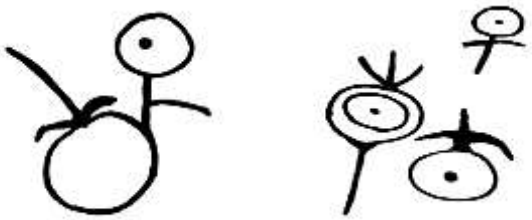


1 2 3 4

D.6.16.a Variations of circle with a trident symbol designs

Another cluster of five such motifs (D.6.16.b) are noticed in a patinated flat rock surface. The first figure consists of two circles, one bigger and another smaller. The smaller circle is arranged above the bigger circle, displaced little right above. The bigger circle is attached with one longer slanting line, at the base of which are two other smaller curved lines on either side of the longer line. Little right to these lines are another vertical line rising from the shoulder of the bigger circle. The smaller circle is attached at the top of the vertical line. A dot is placed within this circle, which is placed somewhat North-west side rather than in the centre. A curved line is attached about the middle of the vertical line. The second figure in the group consists of two concentric circles with a dot in the centre. A slanti8ng line is attached at the bottom of the bigger circle. At the top of the bigger circle there is a three pronged trident like attachment. At the bottom right of this figure there is a circle with a dot in the middle. On top of this

circle there is a three pronged depiction which has the two outer lines dropping down. Little above to the North-east of these figures is another smaller circle with a dot in the centre. This circle is attached with a slanting vertical line having two slanting horizontal lines.



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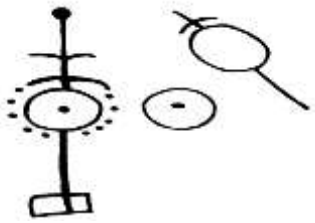
D.6.16.b

The (D.6.16.c), stands quite different from the rest in the depiction of being half engraved and bruised. It has a pair of concentric rectangles. Three vertical lines emanate from the inner rectangle. These three lines connect to the bigger circle which has a smaller circle inside. From the top of the bigger circle another three vertical lines rise. The middle line, which is taller than the other two supports a small circle with a dot in the centre. This is quite intriguing, since all the circles so far noticed at least from the site bears only one circle and sometimes concentric circles. The three vertical lines are seen running from the bottom supported by a double rectangular box. The bottom portion is engraved, whose thick lines are clearly visible.

D.6.16.c Half engraved and bruised motif

This depiction consists of three circles (D.6.16.d), the first motif stand unique in its own. It has 'circle with dots' running around the periphery. The vertical line connected to the bottom is supported by a rectangular box. Unlike the other motifs, the top vertical line has a small dot and two short bended horizontal lines. A similar depiction with dots has been found in the petroglyphs of Central African art, believed to represent the moon 'with its haloes' and others as the sun.[28] Different interpretations have been proposed about the circle in different regions of the world. However Willcox, asserts that "circle and rays were never a conscious representations of the sun."[29] The example cited does not intend to indicate the meaning of the motif to be of similar nature in spite of similar appearance, to the study area but only to suggest some ideas which might provide better understanding of the meaning behind. On the right are noticed two such similar motifs which are faintly visible. A circle with a dot and another complete circle without a dot are placed side by side within a short distance. The second circle has left slanting lines attached at the bottom and top. The top line is intersected by a crescent like curved line.



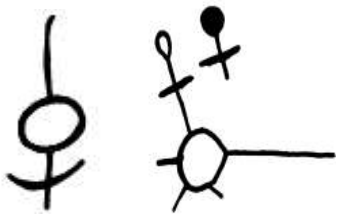
D.6.16.d Circle with dots around the periphery

At Karakamukkala, also the circle is the dominant motif. Here the circle is found repeated in many forms from small circles to large circles, accounting to a total of

[28] Ibid., 97.

[29] Ibid.

eight motifs. The first set with four motifs are placed randomly over the other (D.6.16.e). They include circles, without dot in the centre, very much similar version at Peddakaonda site, except for a completely bruised motif. The first figure has a circle joined by vertical lines on top and bottom. The bottom line is intersected by a crescentic horizontal line. The second figure has a bigger circle joined by several lines around it. On top of the circle, there is a slanting vertical line which is capped by a smaller circle. A horizontal line cuts through the middle of the vertical line. Three smaller and one larger are attached around the circle with equal space.



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D.6.16.e Circles without dot

The second category is again a set of four motif circles (D.6.16.f). Out of four motifs, three are found clustered in one spot and a solitary motif in separate boulder. Distinctive of these four motifs are the two short horizontal lines at the top as well as at the bottom of the circumference. The horizontal lines that run through are bended and the first motif of the three has a unique three line cut right across from the circle circumference. This motif has no dot in the centre, probably has been retouched by later people. At first glance they look like human stick figure with bent hand downward. The motifs found here, falls, with a few exceptions but having certain characteristics with the former site.

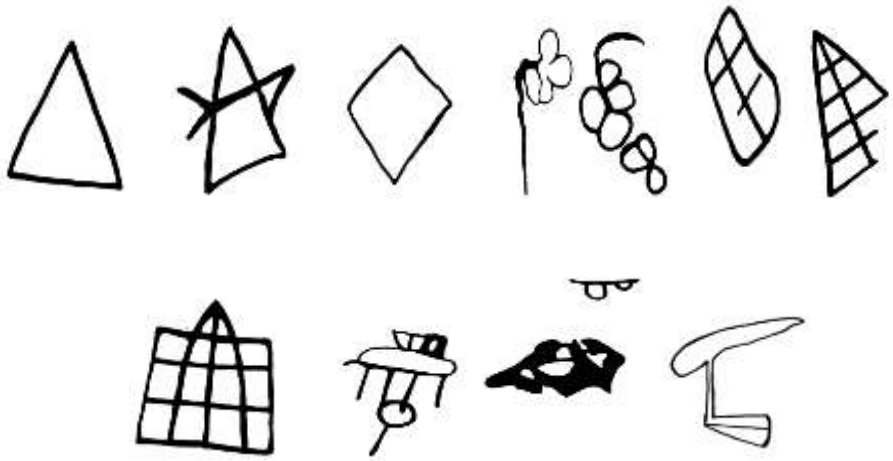
D.6.16.f

Two emphasised circles are noticed at Budagavi and Chinnakonda (D.6.16.g). The first motif slightly bent with horizontal lines at the top, which resembles a 'trident' is noticed at Budagavi. The second motif of Chinnakonda, is unusual in having an over emphasised circle and also a curved trident like motif supported by a short vertical line inside the circle. This appears to express the same artistic drive though in a different style.

D.6.16.g

Second in sequence are the symbols which include combinations of rectangles, floral designs, game board, cattle hoofs, wheel (chakra), spirals etc. These symbols are found in multiples along with other motifs at Peddakonda, Bukkacherla, and Karakamukkala. The former site accounts for the highest concentration, wherein a total of 12 such motifs were noticed (D.6.17.a). The symbols consist of two rectangular motifs, a solitary square, two floral designs, three game boards, an abstract motif which could be depiction of a reptile inter joined by a circle motif ?, an abstract motif and one

honey comb placed on top and an engraved motif difficult to identify could be a wind mill supposed to belong to later period. The "game boards" depictions are common in rock art sites of South India and in Central India as well.[30] These similar game board designs have been noticed at Vijayanagara[31] and have been described as hunt games[32] or strategy game.[33] Vasantha writes, "the hunt game is played by the agriculture class in the present day,"[34] and this examples may point to the continuous age old tradition, of the prehistoric folk.



D.6.17.a Rectangles, floral designs, game boards, honey comb etc.

Starting from left (D.6.17.b), motif like cattle hoof is found engraved on a boulder at Katamadevudu. The second motif is an engraved '*chakra*' or 'wheel' with seven spokes. Third a motif like sauce pan are noticed on a flat surface of a huge rock boulder at Karakamukkala. The fourth is an interesting spiral motif, noticed at

[30] E. Neumayer, *Lines on Stone: The Prehistoric Rock Art of India,* 94.

[31] John. M. Fritz and D. Gibson, "Game boards at Vijayanagara," *Academia edu* (2006):65 https://www.academia.edu/12129306, pdf.

[32] Ibid., 66.

[33] R. Vasantha, "Board Games from the City of Vijayanagara" in *International Journal for the Study of Board Games,* vol.6 *(*2003):27, https://www.academia.edu/12129306/.pdf.

[34] Ibid.

Velpumadugu. The motif has six spiral tie knots three each on two sides. The top has two curved lines and on the bottom two 'x' lines. A '*chakra*' symbol is also evident in the middle. The motif probably belonged to later period. The last is an abstract motif from Bukkacherla found in association with bull figure (Plate-25a).

1 2 3 4 5

D.6.17.b

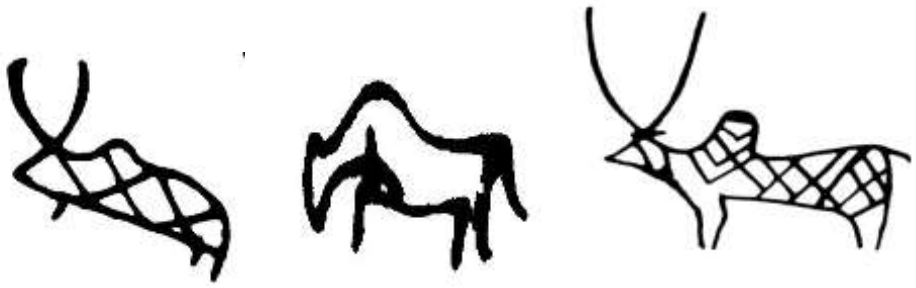
Pictographs

Cattle figures

A total of ten cattle figures of rock paintings are found from the two rock shelters of Budagavi designated as rock shelter 1 and rock shelter 2. The paintings are in red ochre depicting humped bull one of the characteristic depiction of the Neolithic as has been found in a number of occasions in Andhra and Karnataka petroglyphs. The figures are found not in discreet but in association with other figures in the panel. In rock shelter 1, three humped bulls are shown in moving gait (D.6.18.a). The bulls are seen moving towards one direction facing west. Two bulls have criss-cross lines[35] on their body with 'v' shaped horns. While the other is drawn in thick outline, devoid of horns and body design. The first bull is drawn semi naturalistic or schematic with slanting lower body and tail is absent. The prominent horns, pointed mouth and body designs clearly discerns the artistic value except for some cases which could be probably due to fading or weathering of the rocks. The second bull is schematic in style with stiff body. The

[35] Ibid.,90.

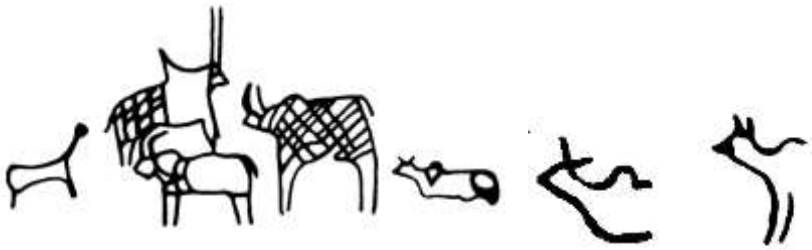
head is lowered towards the ground, with one front and two hind legs slightly bent, which give the impression of movement. The prominent hump and the straight tail running through the lower body show the characteristic of a bull. The bold thick outline brush which runs simultaneously all over point to a strong note of the artist's skill. The third bull is remarkable for its naturalistic execution. The outline is very prominent with every detail of physical proportions. It has criss-cross lines or intersecting lines all over its body till the horn near the head portion. The protruded eye catching hump is also done with the lines as seen in the body. The bull stands pompous with slightly curved, 'v' shaped horns, pointed mouth, straight tail and both the front and hind legs finely expressed in movement. The body distinctively filled with lines, gives a strong deliberate attempt of the artist's appraisal of the vitality of which it stands out of all the figures in the panel.



D.6.18.a Humped bulls

In rock shelter 2, similar depictions of six bulls with visible hump and probably a calf is noticed (D.6.18.b). Unlike in rock shelter 1, the bulls are arranged in different orientation where a bull supposed to be mother followed by a calf is facing east and the other bulls are seen to be facing west direction. The bull emerging from west and facing east is schematic in style with a slender body, low hump and straight long horns. Its hind legs are bent and front legs joined diagonally. It has a distinct body with criss-cross design on the hind portion and half of upper part in flat wash. The short straight tail is clearly visible. The calf seen behind is faintly visible and is drawn in flat wash. Except

for the rounded head and legs no clear details of physical proportions is visible. The two bulls facing west, profile proportions are very clear. They are seen one behind the other. Both the bulls have low hump and curved horns. They have straight short tail and visible front and hind legs. Similar body designs of criss-cross lines are seen in both the bull figures. While the front cow only has criss cross design on front half and half in flat wash and the figure following behind has complete designs all over. The overall scenario suggest of the animals grazing. The third bull following the above bull figures has a unique profile. It has a long extended body, with 'v' shape design drawn from the hump and intersecting right at the fore leg. At the hind body is seen another design covering most of the hind portion which looks like a thick brush wash run through and give the appearance of the hind body in flat wash. It has a prominent pointed mouth and short wide horns. The legs are not visible. The absence of legs, probably suggest the artist clear intention of depicting a sitting posture. The last two figures are faintly visible and almost faded. Both the figures have half body profile. The figures look like emerging from the end of the wall, with their raised head and half body. One of the figures is painted in flat wash while the other seems to be in outline. The flat wash figure has an elongated neck placed far apart from the hump. The two short horns almost faded looks like a random stroke. At first glance, it gives the impression of a bird figure. Except for the hump and horns it does not share any similarity with the bull figure. The last figure is almost faded. The faintly visible portions are the two front legs, pointed mouth and paint smeared head, which could possibly be the horns.



D.6.18.b Humped bull moving opposite direction

Deer

Three deer figures in red ochre are noticed from the rock shelter of Budagavi (D.6.19). All these figures are schematic in style and drawn in thick outline. The first deer has a slender, curved body, pointed mouth and straight long horns. The mouth portion is shown as a horizontal line with no attempt to emphasise the detail. The pigments are very fresh and well preserved, that shows every detail. On close observation, stylistically this figure shares a close similarity to Kethavaram deer paintings.[36] The second deer is faintly visible with fragmentary lines. A major portion of the pigments have faded. The only visible lines that can be observed are the lines indicating the body, legs and horns, which resembles a deer. This is assumed based on the size and posture of the body. Both, these figures have no depiction of tail. An interesting representation, is the third deer that shares similar features in body design to humped bull criss-cross design and also of the deer bruising from Chinnakonda, except the size. The deer schematic and is drawn in thick outline with a clear tail, mouth and horns. The front leaping legs are stumpy compared to the hind legs. The pigments seem to have run from the upper part resulting in lesser density at the lower portion. All the figures are in red ochre pigment. The body posture and orientation suggests the animal in motion.

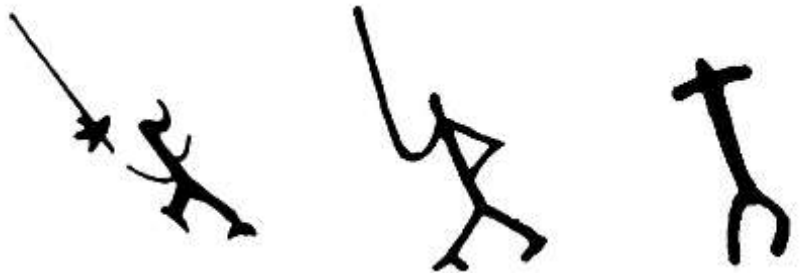
[36] Ibid., 90.

D.6.19 Deer in moving posture

Human or anthropomorphic figures

Three human figures in red ochre were noticed from two rock shelters at Budagavi (D.6.20). All these figures are drawn schematically and in flat wash style. The figures are shown in motion. They occur in separate panels with other figures, rather than as discrete images as seen on petroglyphs. Out of the three figures, two human figures are noticed from the first rock shelter. The first figure is faintly visible, difficult to see the head portion. The figure seems to be walking towards a direction with a shield like object in the right hand. The left hand is upraised and a line attached to the waist or rope like object seems to be adornment or weapon. The legs are stumpy with right leg looking like leaping forward. The second human figure on the same panel, shares the similar features like the former figure, but is more visible and well preserved. The figure is having a well-defined stiff body and oblong head rendered by extending the body stroke above the shoulder with no clear demarcation to indicate neck or head. This figure has left hand resting on the waist and the right hand extended holding a disproportionately long stick. The legs are spread apart, showing dynamic movement. Looking, at the posture both the figures seems to be engaged in some sort of hunting or chasing animals or showing the force for hitting with the right hand. The third figure, faintly visible is drawn in stick-like form. The figure has horizontal outstretched hands which look like ‘T’. The legs are executed elegantly with a slanting right leg and bent

down left leg. However, no head or upper portion is noticed at present due to the nature of the surface. Only a small extension of line above shoulders suggest head. This figure shares more or less similarity with the anthropomorphic figures from the rock shelters of Puricherla.[37]



D.6.20 Human figures with shield and stick-form designs

Handprints

In the rock shelter of Budagavi, six faintly visible handprints were found among a variety of other figures in the panel (D.6.21). All the handprints are in red ochre pigment. Of the six handprints, five are found in one panel (Plate-29b) and a solitary handprint is found in a separate panel. The clustered five prints are arranged in different orientations. The hands are placed at the right end corner beyond the other paintings. They are complete hands with all digits. The presence of palm, finger arrangement and the visible thumb suggest the prints as left hands. The visible gaps along the fingers as seen in all the portrayed handprint motif indicates direct hand impressions. They appear to have been made with the palm placed flat against the rock. Thumbs are prominently visible in all the motifs. Three prints are still in good condition with visible characteristic features while the other prints one placed at the top and bottom are faintly faded, only retaining the outlines. According to Chandramouli,[38] chronologically these

[37] Ibid., 126.
[38] Ibid., 170.

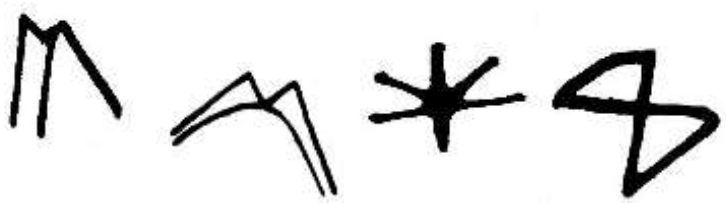
prints can be dated with the humped bull paintings in the same panel. This he expressed in terms of similarity in preservation and colour usage.

Only one positive stylized hand is recognized at a separate panel with other figures. The handprint was placed on top over a group of other animal figures. As of now, the probability and the best assumption about placing could be that they were placed in a manner to interact with the animals? or could be for other reason if they so have. The hand has extra-long straight lines for fingers and a proportionately small outlined palm. The fingers are all of the same length, the thumb; index and middle finger are joined and come together in a point with the straight two fingers drawn in a very schematic style. Here, the short thumb indicates that it is a left hand.

D.6.21 Handprints in different style

Symbols

A total of 5 symbols painted in red ochre were noticed from Budagavi rock shelter (D.6.22). The first figure is a motif with three slanting vertical lines, the second motif is composed of a set of parallel meandering lines, could be depiction of mountain peaks (?), third an ‘asterisks’ or ‘star’ and fourth a set of two triangles joined together, possibly an abstract depiction of a bird(?). All the symbols are in thin outline of red ochre pigment, faintly visible.



D.6.22 Vertical lines, mountain like design, asterisks and abstract motif of bird

Themes or scenes of motifs

Based on the classification of the subject matter of the rock art, an attempt is made to understand the composition or narration if there was any. The individually described motifs have been studied on the basis of theme and scenes. This was done as such that in many cases the motifs are found associated with the other figures and rarely do they appear as discrete images. To illustrate the composition or narration both pictographs and petroglyph motifs are given equal treatment, where ever any association was evident. This is done as a resultant dominance of petroglyphs, in comparison to pictographs less in number. However, just as the nuanced chronologies are, composition remains frustratingly absent, except in few cases. As such thematic and stylistic traits were taken into consideration to gather the representation of the motifs on the rock. Taking this into consideration an effort was made to draw the possible light into which the cattle and its associated figures revolve around the socio-cultural fabric of the Neolithic communities of the study area.

Subsistence scenes

The subject of the petrolgyphs and pictographs are the depictions of cattle, being the main theme. Thus, thematic analysis becomes difficult and hardly do we see any direct visual narrative scenes, and even if there were any, the only subject matter is cattle.[39]

[39] E. Neumayer, *Lines on Stone: The Prehistoric Rock Art of India,* 177.

However, the evidence of two human motifs in red ochre pigment of Budagavi rock shelter, demonstrates its association with hunter. The human motifs shown moving towards an animal with a shield like object, seems to demonstrate the chasing of an animal. This could be the only direct clue to engagement in some sort of hunting scene (Plate-25b). The numerous depictions of humped bull, and the identification of Wild ox *Bos Nomadicus* and domesticated ox *Bos Indicus* at Budagavi (Plate-26a & b) and Velpumadugu indicates the subsistence pattern and introduction of domestication of cattle along with wild animals. This is attested by the finds at Palavoy, in the study area where *Bos Indicus,* bones were found in the deposits,[40] and is supported by the excavation of ashmounds at Piklihal and Maski that they were "cattle keeping pastoralists".[41] The absence or rarity of small game in the rock art could suggest that it was not worth the hunter-artists effort to depict the animal as an aid to hunting. So, also is the absence of plant depiction but that does not qualify the absence of ignorance of plant cultivation. There is no scene of hunting depicted in the rock art corpus of the region.

Symbolic and ritual representations

Rock art has been looked at with the rich meaning of symbolism and ritual or religious purposes. The rock art of the study area also presents such symbols as triangles, honey comb, floral designs, star, meandering lines, game board, cattle hoofs, endless knot, chakra, circles in different size and form. Interesting is the 'trident-with-a-circle' appearance with the bull noticed at Peddakonda and Budagavi (Plate-27a & b). The religious significance is obvious from the two depicted motifs, the trident is a sacred

[40] Rami Reddy, *The Prehistoric and Protohistoric Cultures of Palavoy* (Hyderabad: The Government of Andhra Pradesh, 1976), 52.

[41] David Robinson, "A Historiography of the Neolithic Rock Art of Karnataka: Legacies, understanding, and new dimensions," *Academia edu* (2007):1-2, https://www.academia.edu/3417555.pdf.

symbol and is used in association with religious ascetics and with Siva as their patron[42] while the bull is revered and occupy a place of importance even in the present Indian society. Chandramouli, has also expressed the same view on the depictions at Naidupalli, where several human figures are shown dancing in front of this circle-with-a-trident symbol.[43] The cattle hoofs impressions considered "the foot prints of Shiva's bull Nandi"[44] is also noticed at Katamadevudu (Plate-28c). Hand prints are a common feature noticed in many rock art sites across the world. In the study area, the hand prints painted in red ochre are noticed at Budagavi. Their occurrence with other figures suggest some sort of ritual or religious belief. Even today in rural areas they are seen painted on the walls of new houses to ward off the evils.

Cultural Scenes

Only three human figures at Peddakonda, represent this group. Out of three, two are depicted with ornaments, possibly a head gear and object at waist portion (Plate-27c). The body posture of two figures are depicted with joined hands, which suggest some sort of activities like dancing.

Conclusion

In summary, this pilot study, brings to limelight the rock art documented from eight rock art sites. The spatial distribution of the sites concentrated in high elevation (490 to 545 m, MSL) in comparison to surrounding plain area, provides insights into preference of the location in higher landscape. As indicated earlier, the rock art sites are located on the hill tops of granite outcrops, which offers a stunning scenic surroundings, looking

[42] Valerie J. Roebuck, "Weapons as Symbols in Hindu Art," *in Symbols in Indian Art and Religion: The Indian and the Comparative Perspectives*, ed. Karel Werner (Delhi: Motilal Banarsidass, 1991), 153.

[43] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis*, 151.

[44] E. Newmayer, *Lines on Stones: The Prehistoric Rock Art of India*, 194.

the plain below. In addition to aesthetic scenery, these areas with rugged rocky terrain combined with thorny bushes of acacia offer several difficulties, as reaching them involves climbing the high cliff of the granite outcrop. In some cases, images are in locations difficult to reach, where one is required to climb down through the jagged boulders for instance, at Chinnakonda site, the images were noticed in a flat rock surface, locally known as "table rock" due to its nature of placement, which looks like a table among the rocky outcrops. An interesting feature noticed is that several rock boulders which are ideal for depiction, those located in convenient places and approachable heights are left out. This points to the question, why highly difficult and inaccessible areas were selected for rock art. This can be best explained of the link between the importance of place selected and symbolic meaning within the wider landscape. The hills and "cave were used as a place of sanctity for religious activities and aspirations,"[45] while exploring the sites in the area, this has been noticed and even today, the hills serve as the basement for the erection of temples. A symbolic link between the hills and present people is found in the area. The Katamadevudu *konda*, associated with the god *Katamayya*, is seen worshipped by the people of the village with a ritual celebration. During the month of March (i.e. 16th 17th 18th), people from the village come to the hill, where a ritual is conducted with bare foot going around the base of the hill. This as per information, is done for the protection and prosperity of the village. This ritual practise may also explain one of the possible association of the rock art and its occurrence in the high elevated places. Further, it is also likely that the Neolithic folk thought that difficult approach of the sites could help in their better preservation.

[45] Ibid.,19.

Rock art sites close to Neolithic settlement has been noted by many researchers like Foote, Allchin, Neumayer etc., and interestingly the rock art sites under study also reveals the similar feature located overlooking the habitation sites. The phenomenon of rock art and close to water source has been noticed in the study, either a seasonal stream or lake known to locals as *'cheruvu'* in the vicinity within 0.5 – 2 km radius. One of the possibility, could be due to the location of the study area on the reaches of the rivers Pennar and Hagari. Though not conclusive the rock art, thus, denotes a certain facet of landscape and its relationship with ritual practises of the people and that the rock art was not practiced randomly, wherever places were available rather were selected on preference.

In case of rock art content, petroglyphs dominate the pictograph, the latter noticed only at Budagavi site. The subject matter is cattle, mostly of the humped bull in both the types. In petroglyphs, they appear as single images, only in two cases, they are depicted in multiples, for example, a pair of humped bull facing each other at Velpumadugu, bovine cattle being placed upright one after the other in vertical position noticed at former site and at Peddakonda. The red ochre bulls are executed in outlines and in association with other figures and are often decorated with variety of designs, which the petroglyphs are devoid of any such body decoration. Other animals are few compared to bull depictions. They includes deer, a schematic depiction possibly of a bird? an elephant and few unidentified figures probably of later period. Deer figures are noticed in both petroglyphs and pictographs. One of the unique depiction in petroglyphs, is depiction of a large sized deer, with designed body noticed at Chinnakonda. An interesting feature noticed is the portrayal of the bull in prominent position when found in association with other figures. They are often depicted in moving posture, looking certain direction, sometimes up and down. This points to how,

the painters tried to depict the animals in naturalistic way as they would have imagined and seen it.

The second in common are the geometric symbols. They include 'circle-with-a-trident', rectangles, floral designs, cattle hoof, chakra or wheel, spiral tie knot, game board, parallel meandering lines and asterisks or star. Along with geometric symbols, anthropomorphs or human figures and hand prints are also noticed. The human figures are less impressive, schematic in style and in stick form. A distinct trait noticed is the 'circle-with-a-trident' symbol found in petroglyphs. They appear as single images and in composite groups, in variant forms, sizes, shapes and techniques. Most of the symbols are bruised, except two examples of engraved technique noticed at Peddakonda (Plate-28a & b). Apart from the study area, the symbol has also been reported from "Regonda, Budigapalli, Mudumala, Chagatur,"[46] "Naidupalli, and Adoni West,"[47] in the region of Andhra Pradesh. The symbol is considered "the hallmark of Megalithic art,"[48] but to surprise no megalithic burials or remains were found in the present investigation of rock art sites. The local interpretation of the same, is that it symbolises '*Pirladevudu*' or 'male god'. However, ethnographic data is required to support this interpretation. Nonetheless, the repeated occurrence of the symbol, thus, exhibits a distinct trait of the region and this points to the question of their importance and origin as well.

A tentative attempt on interpretation to understand the symbol and possible origin, is attempted on taking clues from its association with the bull figure. They are noticed at Peddakonda and Budagavi sites (Plate-27a & b). On the evidence of depictions at the latter site, Chandramouli, suggested that "the symbol could be of

[46] V.V. Krishna Sastry, *The Proto and Early Historical Cultures of Andhra Pradesh,* 46.

[47] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis,* 111-134.

[48] Ibid., 172.

Neolithic origin, which subsequently became the hallmark of Megalithic art."[49] This was done within the context of 'Nuclear Zone' of Paddayya's, regional variant theory of South Indian Neolithic culture. The present study area of the rock art sites fall in the "variant 4,"[50] of regional distribution. The view is supported by the artefactual surface remains collected in the form of polished stone tools, sherds of burnished grey ware and habitational deposits noticed in the investigation. As for now, we have to depend on this claim unless new findings and studies are conducted on the said symbol. Though, no substantial evidence can be made on its origin on the rock art, its frequent appearance within the landscapes, its ability of survival clearly indicates the continuing efforts of the ancestor's rock art by the later people occupying the same landscape. The indigenous people across the globe believe that "the art of earlier traditions was not made by other humans, but been placed by some spirits or deities," and this continued to play a central role in their spiritual world.[51] The local interpretation of the same, however, is that it symbollises '*Pīrladevudu*' or 'male god'. This however does not suggest that the local inhabitants of the area are the descendants of the earlier art communities, but it indicates adaption of the earlier art into their own to fit their own interpretations. Though the precise nature is yet poorly understood on the origin of the symbol at present, however, the religious significance is obvious from the two depicted motifs the bull and 'circle-with-trident symbol'. The trident is a sacred symbol and is used in "association with religious ascetics and with Siva as their patron,"[52] while the bull is revered and occupy a place of importance in the religion and symbolism as well in the present Indian society.

[49] Ibid., 148.

[50] Ibid., 73.

[51] Bednarik, *Rock art Science*: *The scientific study of Palaeoart,* 52.

[52] Valerie J. Roebuck, "Weapons as Symbols in Hindu Art," 153.

Considering, the facts discussed above, it can be aptly said that the motive of the rock art in present study area was not inspired by "art for art's sake," rather it has functional significance. The repeated occurrence of certain motifs such as bull and 'circle-with-a-trident' suggests ritualistic beliefs of the prehistoric artists. Another feature noticed is the thematic uniformity, in petroglyphs and pictographs. The theme being the cattle, especially the humped bull provides clue of the importance in socio-cultural life of the prehistoric communities. An interesting feature noticed in the depiction of the humped bull is the coexistence of both wild and domesticated species. Examples are indicated by the depiction in the rock paintings of Budagavi. According to Chandramouli, "the low hump, slightly curved horns and body portion filled with intersecting lines depicts the wild ox (Bos *Nomadicus*) (Plate-26a) while (Plate-26b) the protrude hump and 'v' shaped horns represents the domesticated ones (*Bos Indicus*)."[53] The bruisings of a pair of long horned humped bull noticed at Velpumadugu, are the representations of "acutifrons type"[54] a common type of humped bull in present day of the study area and of south India (Plate-29a). The view is supported by the animal bone remains at Palavoy,[55] about 60 Kilometre to the north of Velpumadugu bruisings which revealed majority of bones belonged to cattle. Thus, indicating the vital role of cattle in the life and economy of the Neolithic folk and points to the practise of pastoralism.

To conclude, the rock art of the study area is primarily focussed on three aspects, i.e., the rituals, subsistence and its spatial relationship. The overwhelming depiction of cattle certainly would not be out of place to relate a society where cattle was considered symbolic as well as of economic importance. The depiction of 'circle-

[53] N. Chandramouli, *Rock Art of Andhra Pradesh: A New Synthesis*, 170.

[54] F. R. Allchin, *Piklihal Excavations,* 118.

[55] Rami Reddy, *The Prehistoric and Protohistoric Cultures of Palavoy*, 117.

with-a-trident', restricted to a specific area or region suggest its ritualistic nature. Although, the meaning and interpretation offered here of the same may differ across the region. There is no doubt that these symbols were meaningful to the creators. We might not know what they mean, but the people of that time certainly did. The repetition of the same symbols for so long and at so many sites tells us that the artists were making intentional choices. It seems likely that this invention had an agreed upon meaning and that the symbols did not come out of a vacuum. The present investigation though limited in nature provided a platform by documenting the existing know rock art sites and adding newly discovered sites to the list of the rock art sites in the region and the long existing tradition. Finally, it is to point out that the prevalence of human intervention in the form of commercial granite quarrying is a serious threat to preserve the traditions of the rock art sites, in many cases they are found destroyed. An example is from the current quarrying at Velpumadugu site (Plate-29c), where out of three rock art depiction boulders, only two remains now. This study therefore underlines the extent of challenge that lies as a stepping stone for further systematic investigation of the rock art sites, before the evidences are erased completely.

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