

## Basic Issues in Harappan Archaeology: Some Thoughts

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### Abstract

*The identification of the Harappan Civilization in the early twentieth century was considered to be the most significant archaeological discovery in the Indian Subcontinent as it pushed the beginning of settled life by 2000 years. Contemporary to the Mesopotamian and Egyptian Civilizations it was unique in its town planning. Spread over major parts of the western and north-western subcontinent, its influence is seen to the Tajikistan border in the north and the Gulf region in the west with over two thousand sites found till date. The past eight decades of research have brought to light many important details of the culture including the cultural process involving its origin, maturity and decline but certain aspects such as the terminology, climatic influence, regional variations, script etc are still very flimsy. To gain more information the focus of research will have to shift from Mega Site Archaeology to Small Site Archaeology with large multidisciplinary research projects to acquire a more holistic picture of the 'Harappan culture'*

### Introduction

The identification of the Harappan Civilization in the early twentieth century was considered to be the most significant archaeological discovery in the Indian Subcontinent, not because it was one the earliest civilizations of the world, but because it stretched back the antiquity of settled life in the Indian Subcontinent by two thousand years at one stroke. Vincent Smith (1904), one of the leading historians of the era, had written in the beginning of the twentieth century that there was a wide gap (Vedic Night) or a missing link between the Stone Age and Early Historic periods in Indian History and that settled life in this part of the world began only after 6<sup>th</sup> 5<sup>th</sup> centuries BC, probably during the Stupa (Buddhist) period. The discovery of the Harappan Civilization proved him wrong and the Indian Subcontinent brought to light its first civilization that was contemporary to the Mesopotamian and Egyptian Civilizations. This Civilization was unique compared to the two contemporary civilizations on account of its extent and town planning. Extent-wise it was much bigger in size than the Mesopotamian and the Egyptian Civilizations put together and spread beyond

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the Subcontinent. Its town planning included a citadel and lower town, both fortified and with a checkerboard type of planned settlement which were unique and unparalleled in the contemporary world. Intensive and extensive works have brought to light over two thousand sites till date. Its distribution pattern suggests that it not only spread over major parts of the western and north-western subcontinent, but its influence is seen beyond, up to the Tajikistan border in the north and the Gulf region in the west. In true sense this was the only civilization in its contemporary world, which was international in nature.

The culture flourished due to many factors, important among them being the prevalence of the congenial climatic conditions (Krishnamurty, 1981; Shinde et al., 2001), availability of most fertile plains of the Indus and Saraswati, and surplus trade with Mesopotamia, Persian Gulf and Egypt.

Sir John Marshall identified the Harappan Civilization on 20<sup>th</sup> September 1924 and since then numerous scholars and institutions, both from India and outside, have been engaged in unravelling the history of this most important phase of Indian culture. No other culture in the subcontinent has received as much attention as the Harappans; however, it should be mentioned that what we know today about this civilization is mainly the history of their urban life, as the reconstruction done is based on the data recovered from large settlements identified as either cities or towns. Comparatively very few rural Harappan settlements have been excavated systematically on large scale. In order to understand the Harappans completely a holistic approach is required with sufficient systematic work on different categories of sites. The work carried out at the site of Mehrgah in Baluchistan has already demonstrated the origins of this culture, which was gradual from the modest beginning of settled life around 7500 BC (Jarrige *et al.*, 1995). Identification of the three phases of Harappan culture- Early Harappan (3300-2600 BC), Mature Harappan (2600-2000 BC) and Late Harappan (2000-1700 BC) suggests a gradual cultural process origin, development and decline. The precise reasons for this cultural process is not known, but it is presumed that climatic fluctuations may have been one of the many factors responsible.

## **Basic Issues**

### **1. Terminology**

The culture when identified at the site of Harappa, in the jurisdiction of the modern large village of Harappa in the Punjab province (now in Pakistan) in 1924, was termed as the Harappan Civilization. It was named after the type-site where the culture was first identified. However, with the passage of time and the discovery of more and more sites covering a vast geographical locale from time to time the nomenclature for the culture underwent constant change. Different scholars identified this culture by different names and today the Harappan Civilization has three different terminologies- the Indus Civilization, the Indus Valley Civilization and more recently the Indus-Saraswati civilization. There is no need to cite references to this as it is a well known fact for all archaeologists/historian dealing with the Harappan Civilization and these different terms have been prolifically used in various writings. Of course each one of these new terminologies have been provided with a convincing explanation as to why he or she prefers that particular term.

This trend is dangerous as there may not be a stop to this tendency, which is growing. We should not be surprised if tomorrow someone would like to call the Harappan Civilization as the Indus-Saraswati-Gujarat Civilization with a valid point to do so. There may not be an end to this confusion. Students and others not so familiar with the archaeology of the Subcontinent are all confused and are not sure whether all these different terms are for the same culture or for different cultures. To avoid this confusion we need to go back to the archaeological ethics and follow the unwritten convention in archaeology, e.g. name the culture after the type-site where it is discovered or identified for the first time. And therefore it is suggested that we maintain the original term “Harappan Civilization” instead of switching over from one term to another, which does no good but more harm to the subject.

## **2. Origins of the Harappan Civilization and the roles of Regional Cultures**

Of many excavations undertaken over a long period of time in the Subcontinent, the one carried out at Mehrgarh between 1974-1985 (Jarrige *et al.*, 1995) is in real sense epoch making. Not only has it provided the earliest evidence for settled life in the Indian Subcontinent going back to the seventh millennium BC, but has also provided solid evidence for the steady and gradual emergence of the Harappan elements. The evidence from Mehrgarh laid to rest the earlier controversial theory of the Western world being responsible for the emergence of the Harappan Civilization. The excavations have demonstrated seven different stages of development prior to the emergence of the Harappan culture in the last stage (VIII). What is evident here is the introduction of various Harappan elements at different levels at the site throughout the first seven phases, culminating into the emergence of the Harappan culture in the last stage/phase (VIII).

Three different phases of the Harappan culture - Early, Mature and Late demonstrate the cultural process from origin through development to decline. The Mature Harappan phase is the most prosperous one and shows the development of the Civilization into an urbanized society. The evidence from various excavated sites now leads us to believe that this phase has emerged out of the Early Harappan phase. As is evident the process of transformation from Early to Mature Harappan appears to have happened simultaneously over the major Harappan region including Baluchistan, Sindh, Indus-Saraswati basin and Gujarat.

The earlier belief that the Harappan Civilization (Mature Harappan phase) was a homogenous entity has turned out to be a myth. Within the Harappan region itself we find manifestation of the regional variation and three such regional variations (Domain according to Possehl, 2002) can very distinctly be identified). The first scholar to point out this variation within the Harappan Civilization was J.P. Joshi in 1984 (Joshi, 1984 and Possehl (2002) has identified more than 7 domains on account of geography and settlement pattern data. However, on the basis of variations in the material culture, three zones can clearly be distinguished. The excavations at Rojdi by Possehl and Raval (1989) were important from the point of view of identification of the regional variation of the Harappan Civilization in Saurashtra. It was noticed that the material culture associated with the Harappan culture at Rojdi showed some difference compared to that found in the Sindh-Baluchistan region. This was found true for the whole Saurashtra region. This difference was treated as a regional

variation of the Harappan culture in Saurashtra and termed as Sorath Harappan (Possehl and Herman 1990). Similar regional differences in the material culture, more particularly in the ceramic assemblages of the Harappan sites is visible in the Saraswati region. The sites located in the Sindh-Baluchistan region have classical Harappan elements and form another distinct region within the Harappan empire.

A number of Early Harappan cultures flourished in various regions of the Harappan Empire and the Mature Harappan is supposed to be the result of internal development within these Early Harappan cultures. Naturally therefore the features of the Early Harappan cultures persisted through the Mature phase in their respective regions. In the Sindh-Baluchistan region the elements of the Early Harappan Amri-Kot Diji cultures dominated the assemblages of the Mature Harappan phase in that region, whereas in the Saraswati basin the elements of the early Siswal-Sothi continued to be dominating in the Mature Harappan phase in that region. The so called Sorath Harappan phase evolved out of the Padri Early Phase (Shinde, 1998) and hence the continuation of the Padri elements in the Mature Harappan phase there. It is because of this factor that we see variations and the Mature Harappan phase does not look homogenous as was thought by the earlier scholars (Wheeler, 1968).

### **3. Biased reconstruction**

Over two thousand sites of the Harappan culture have been discovered so far, of which only half a dozen are cities and slightly more than a dozen can be identified as towns. Rest of the settlements fall in different categories like small or big villages, processing centres, ports, and temporary camps for exploitation of local natural resources. A glance at the research strategy adopted by the Harappan archaeologists reveal that barring the site of Ganweriwala all the Harappan cities have been excavated on large scale, producing large quantity of data on various aspects like town planning, trade, social, religious and economic. This data has enabled reconstruction of urban or city life of the Harappan people but it represents less than even 3% of the Harappan population. We have however, very little idea of their rural lifestyle, where more than 97% Harappans were living, as “Small Harappan Site Archaeology” does not seem to be a priority of the Harappan archaeologists. Very few small Harappan sites have been subjected to large-scale systematic excavations. In fact there is a need to systematically identify and document different categories of Harappan sites and a number of sites in each category needs to be systematically excavated on large scale which in the real sense will give a holistic picture of the Harappan life and history.

### **4. Climate and Harappan Civilization**

Very little data is available at present on the climate that existed throughout the Harappan period (3500-1500 BC) and the region. A few attempts have been made towards reconstruction of the palaeoclimatic sequence in the Indian Subcontinent with pioneer work being done by much quoted Gurdeep Singh, (1971). The next substantial work was that of Enzel et al. (1999). Both these teams worked in Rajasthan and had data from three salt lakes:

Sambhar, Didwana, and Lunkaransar. But the explanation given for the timing and factors for the desiccation of the lakes and its correlation with archaeological data led to different interpretations. The first group led by Gurdeep Singh (1971) initially (before calibration) proposed good climatic conditions during the flourishing Harappan phase, whereas the latter group led by Enzel (1999) proposed that the Harappan Civilization flourished when the climatic conditions were not very conducive for the human cultures. Both the groups based their hypotheses on the basis of drying of lakes in Rajasthan. These limited studies have drawn a lot of criticism. According to Possehl (2002), the changing salinity of these lakes need not be attributed to changes in rainfall. The geology of Rajasthan is complex. The three lakes investigated are hypersaline today, but there are also freshwater lakes in this same region (Lakes Pushkar and Ganganer). This observation leads to the conclusion that under one climate regime in Rajasthan, there can be both freshwater and hypersaline lakes, calling into question Singh's hypothesis.

Reconstruction of ancient climatic conditions is a multi-disciplinary approach. Only one core from such huge lakes is not enough. Besides, the study of catchment area, history of erosion, vegetation pattern, geology, carrying capacity of the catchment area, tectonic history of the region, etc. have to be taken into consideration when reconstruction of ancient climatic conditions of a region is done. It is absolutely essential to know what the climate was during the Harappan period and its impact on three different phases of the Culture. We need to find out the role of the climate in the origin, development and decline of the Harappan civilization. A satisfactory explanation is still to be acquired for emergence and growth of the flourishing Harappan city of Dholavira (on the Khadir Island of Kutch in Gujarat), which is today surrounded by barren desert land (Rann of Kutch). We need to find out the ecological conditions of this region for which a lot of data on climatic and ancient landscape will have to be generated. Extensive research on this aspect is the need of the hour. The GIS software and satellite imagery photographs can be used to reconstruct the ancient landscape.

### **5. Importance of Indus and Saraswati river basins, Saurashtra and North Gujarat**

The Indus and Saraswati basins covered by alluvium land, no doubt the most important fertile units of the Subcontinent, provided solid agricultural base for the Harappans, where they could raise not only sufficient food grains for the Harappan population but also surplus. These two basins are quite congenial for wheat and barley cultivation. It is because of the production of surplus food grains that the Harappans could make so much progress in technology and art. Besides, they had under their jurisdiction regions like Saurashtra and North Gujarat, which are covered by black cotton soil and coarse soils respectively. The main crop cultivated in Saurashtra was millet whereas North Gujarat has vast tracts of pastureland. Such varied ecological conditions that the Harappans occupied, gave them a lot of subsistence advantages. In case one agricultural zone failed due to a natural calamity, they had another at their disposal to support them. Besides, they did maintain friendly mutual relations with the neighbouring Chalcolithic communities, both on the eastern as well as western borders.

Saurashtra region had access to the resources like carnelian, agate, chalcedony, chert and all semi-precious stones used either for bead or tool manufacture. Besides, the most important source of chank shell (*Turbinella pyrum*), one of the three sources in the subcontinent was along the Saurashtra coast. This was the most important raw material for the Harappans to make bangles and beads. Shell processing centres like Nageshwar on the western tip of Saurashtra was established for production of beads and bangles. They were meant for the supply to the domestic as well as international market. Other resources such as copper from Khetri belt in Rajasthan, gold from Hatti mines in South India, lapis lazuli from Badakshan region in Afghanistan, etc. located away from the core Harappan region were obtained with ease by the Harappans. By developing effective communication networks and exchange mechanisms, they could manage a constant flow of essential raw materials and an uninterrupted distribution of finished goods to other Harappan as well as non-Harappan contemporary settlements. The selection of varied ecological niches gave the Harappans considerable advantages over their contemporaries and enabled them to flourish. In their international trade the region of Gulf, particularly Oman has played an important role as the evidence from the site of Ras al Junayz will indicate (Cleuziou and Tosi, 1994). The Gulf region may have been found as a convenient base in their trade with their contemporaries in the Persian Gulf, Mesopotamia and Egypt. It is quite possible that the merchants from these four regions travelled to places alike Ras al Junayz in Oman for carrying out business transaction and exchange of goods, as it is almost centrally located for all of them. Very rarely would merchants from these cultures travel directly to each other's territory.

## **6. Harappan Writing system and decipherment**

In spite of numerous efforts made by scholars to decipher the Harappan script, there is no agreement between any two scholars and the script has remained the biggest enigma of the Harappan Civilization till date. If deciphered, a plethora of information on various aspects of the Harappan culture will come forth. The letters or script occurs from the Ravi phase dated to around 3300 BC (Meadow *et al.* 1999 and 2001) and continues until the end of the culture around 1300 BC. Asko Parpola, one of the scholars dedicated to the decipherment of the Harappan script states “uniformity of sign sequences throughout the Indus Valley points to only one language having been written. Historically, Proto-Dravidian is the most likely alternative and a good working hypothesis. The script type, the other big unknown, is determined as logosyllabic by the number of signs, average word length and age. Without translations, this type of script can be deciphered only partially-sign by sign”. He further admits that decipherment is obstructed by formidable difficulties. The script has no close relative and its language is debated. Multilingual text- the usual key to the unknown scripts- are lacking and all surviving texts are very short (Parpola, 2005). The only way left is as Parpola (2005) states “successful decipherment of other scripts and the history of writing give methodological guidance. Useful routine tasks include collection of all texts, establishing a sign list, compiling concordances to sign occurrences and analyzing the text for word boundaries other linguistic features”. Collective efforts by archaeologists, historians, linguists, compute analysts, etc. have to be done. At this stage it appears that we should pray to find a Rosetta type of stone with multilingual script.

## 7. Climate and Decline of the Harappan Civilization

The decline of the Harappan Civilization was as dramatic and enigmatic as was its emergence. Of the many reasons, the climate appears to be the major villain in the decline of this great civilization. The reconstruction of the Holocene climatic sequence in the Indian subcontinent, particularly in the Thar Desert area of Rajasthan demonstrated lowering of annual rainfall around 2000 BC that may have caused major decline of the most flourishing first civilization of the Subcontinent. Scholars like Bryson and Swain (1981), Singh *et al.* (1990), Agrawal (1992) have emphasised the role of climate and environment in affecting habitations, especially the Harappan culture. Studies in respect to the reconstruction of climatic sequence carried out in various parts of the world suggest it was not only the Indian subcontinent that was affected, but the whole globe. In other words it was a major Global Climatic Change Phenomenon around 4000 BP or 2000 BC. Yasuda (2001) believes that not only the Harappan but all the civilizations of Eurasia declined around 4000 BP as a result of dry climate.

Studies of regional late Holocene vegetation history have shown that the most drastic changes in the vegetation pattern and cover, an important indicator of climate change, appeared around 2000 BC in different parts of the world. In north-eastern China in the Changbai Mountain region, the most noticeable event of the Late Holocene forest development around 2000 BC was expansion of *Pinus koraiensis* (Sun *et al.*, 1990). Vegetation reconstruction at Kurugai site (northern Sichuan, China) in the eastern part of Qinghai-Tibetan Plateau revealed retreat of forest and spread of open areas at about 2000 BC (Gotanda, 1998). Around the same time in warm temperate forest zone located at lower elevation in the southern Sichuan, sclerophyllous drought adapted taxa expanded, suggesting weakening of the East Asian Monsoon activity with decrease in spring and summer precipitation (Jarvis, 1993). The oxygen isotopes analysis from the lake sediments in the Qinghai-Tibetan Plateau and North Xinjiang provinces recorded maximum aridity between 4500-3500 cal. yrs BP (Wei and Gasse, 1999). In parts of Europe, particularly in the Great Poland Plain the *Carpinus betulus* indicating dry climatic conditions, began its spread around 4100 BP and since 3500 BP has been the dominating species in the forest and the lowering of the lake levels began at the same time (Makohonineko, 1998). The results of pollen analysis from the Ghab valley and El-Rouj basin in Syria show that the climate became dry after around 2000 BC. This dry climate caused a drought and reduced the production of olives, wheat, and barley. People in northwest Syria abandoned their habitation sites completely in the Late Bronze Age because of drought (Yasuda, 2001).

In the Indian Subcontinent a few studies on climate reconstruction carried out also suggest similar trend of aridity around 2000 BC. A work on the core from the oxygen minimum zone off Karachi in Pakistan at water depth of 700 m has produced a unique record of monsoon climatic variability covering the last 5000 years (von Rad *et al.*, 1999). They further noticed that the period from 3900 BP is marked by minimal varve thickness and low turbidity, which they interpret as indicators of low precipitation and decreased river run-off. Thus, the results obtained by various independent researches in different part of the globe do indicate deterioration of climate, which must have had adverse impact on the human cultures including of course the Harappan Civilization.

The deteriorating climatic condition had adverse consequences. One of the mighty and important rivers for the Harappans, the Saraswati dried up and even though the exact contribution of the deteriorating climatic conditions to this effect is not known. There is a possibility of the main river Saraswati (represented by Ghaggar-Hakra today) and its main tributary the Drishdvati, changing their courses and merging with other main rivers like Yamuna due to some tectonic upheaval in the upper reaches. However, the fluctuating climatic conditions may also have contributed to the drying up of the Saraswati. This was perhaps the biggest blow to the Harappan civilization as nearly three-fourth of the settlements were located in the basin of this river. Good fertile arable land and ample supply of water made the basin of river Saraswati most attractive and the Harappans were able to produce surplus food grains here. It will not be far fetched to conclude that the Saraswati river was the life-line of the Harappans. After losing their agriculture base, the Harappans scattered and migrated to the region with readily available pasture land.

There has been a strong debate going on whether the sea level receded around 2000 BC and if so by how many metres? No satisfactory work has been carried out on this so far. Whether it was a world phenomenon or a regional phenomenon is not yet clear. But a number of Harappan ports on the Makran coast fell into disuse as they became almost inland sites after the receding sea levels. This must have adversely affected their international trade with the Gulf and subsequently with Mesopotamia and Egypt. As is well known, the international trade was in favour of the Harappans and was one of the major causes of the prosperity.

After the drying of their international trade, the pace of the decline of the Harappans hastened. The economic decline affected overall Harappan life-style, which is reflected in their material culture. As they lost their agricultural base in the Saraswati basin, they began shifting their settlements away from the banks of the main rivers. New area such as the western part of Uttar Pradesh and the pasture rich area of Gujarat such as Jamnagar District, was preferred by the Harappans in the later stage (Sinha-Deshpande and Shinde, 2005). The culture got mixed up with different local cultures and slowly and gradually merged with them.

### **Concluding Remarks**

Some of the basic issues that have been discussed here are important and they need to be taken seriously and the future researchers will have to design research strategy in such a way that these aspects are taken into consideration. The focus of research will have to shift from Mega Site Archaeology to Small Site Archaeology and sufficient number of sites of the latter category needs to be researched on large scale. Large amount of data from these sites will only help in projecting holistic picture/history of the Harappan culture. There have not been many multi-disciplinary approaches to the Harappan archaeology in India. Archaeological research on the Harappan culture needs support and active participation of scholars from various other fields including geology, environmental science, zoology, botany, physics, chemistry, anthropology, geography, linguistics, Sanskrit studies, ethnology, etc. Systematic scientific research in the Saraswati basin is needed. Excavation of few sites in this basin is



not enough but systematic survey to record settlement patterns, reconstruction of site typologies and generation of archaeological data and their co-relation with the Vedic texts needs to be undertaken in a sustained manner. A systematic and scientific study to find out exact causes of the disappearance of the Saraswati and Drishadvati rivers is must. There is no sufficient data to know about the exact climatic conditions during the Harappan times and its impact on the origins, development and decline of the Harappan culture. A lot of palynological data needs to be cored from the Saraswati basin proper for the reconstruction of the climate of that period. Considering various basic issues it appears there is no alternative but to undertake multi-disciplinary research strategy in various Harappan regions.

Pottery is one of the most important artefacts dug out from ancient sites and the Harappan sites are not an exception to that. Large amounts of pottery is found in the explorations and excavations. This pottery is classified and described by those scholars who either collect them from the surface of the site or dig out from sites. The various criterion and parameters considered for classification and analysis of pottery and the style of describing forms and rim shapes of pottery differ from scholar to scholar. As a result there is no uniformity in the use of either term for the ware or description of pottery form or rim style. In fact there are as many terms and ways of description as there are scholars describing them. In order to bring uniformity in the use of term and description styles, we suggest following the work on pottery from Mohen-jo-Daro done by Dales and Kenoyer (1986). Because of this problem, sometimes it is hard to use pottery data for interpretation. Finally, it is suggested that future research on the Harappan Civilization needs to be problem oriented and multi-disciplinary.

## References

- Agrawal, D.P. (1992). *Man and Environment in India Through Ages*, Books and Books, New Delhi.
- Bryson, R.A. and A.M. Swain. 1981. Holocene variations of monsoon rainfall in Rajasthan, *Quaternary Research* 16, pp: 135-145.
- Cleuziou, S. and M. Tosi. 1994. Black boats of Magan: Some thoughts on Bronze Age water transport in Oman and beyond from the impressed bitumen slabs of Ras-al-Junayz, in A. Parpola and P. Koskikallio eds., *South Asian Archaeology 1993*, Annales Academiae Scientiarum Fennicae, Series B, Vol. 271, (2 vols.), Helsinki, pp: 745-61.
- Dales, G.F. and J.M. Kenoyer. 1986. *Excavations at Mohenjo-Daro, Pakistan: The Pottery*, The University Museum, University of Pennsylvania, Philadelphia.
- Enzel, Y., L.L. Ely, S. Mishra, R. Ramesh, R. Amit, B. Lazar, S.N. Rajaguru, V.R. Baker and A. Sandler. 1999. High-Resolution Holocene environmental changes in the Thar Desert, Northwestern India, *Science* 284, pp:125-128.
- Gotanda, K. 1998. *Pollen Analytical Study of the Eastern Part of Tibetan Plateau*, M.Sc. Dissertation, Kyoto University, Kyoto.
- Jarrige, C., J.F. Jarrige, R. Meadow and G. Quivron. 1995. *Mehrgarh: Field Reports 1974-85- From Neolithic Times to the Indus Civilization*, Department of Culture and Tourism of Sindh, Pakistan and Department of Archaeology and Museum, French Ministry of Foreign Affairs, Karachi.
- Jarvis, D.I. 1993. Pollen evidence of changing Holocene Monsoon climate in Sichuan Province, China. *Quaternary Research* 39, pp: 325-337.

- Joshi, J.P. 1984. Harappan culture: emergence of new picture, *Puratattva* 13-14, pp: 51-54.
- Krishnamurty, R.V., D.P. Agrawal, V.N. Misra and S.N. Rajaguru. 1981. Palaeoclimatic influences from the behaviour of radio-carbon dates of carbonates from sand dunes of Rajasthan, *Proceedings of the Indian Academy of Sciences (Earth Planet Science)* 90, pp: 155-60.
- Makohonienko, M. 1998. *Late Holocene Natural and Antropogenic Vegetation Changes in the Gnienzo Region, Great Poland*, Ph.D. Thesis, Nicolaus Copernicus University, Torun.
- Meadows, R., J.M. Kenoyer and R. P. Wright. 1999. *Harappa Excavations 1998*, Report submitted to the Director General of Archaeology and Museums, Government of Pakistan, Harappa Archaeological Research Project, Harappa.
- Meadows, R., J.M. Kenoyer and R. P. Wright. 2001. *Harappa Excavations 2000-2001*. Report submitted to the Director General of Archaeology and Museums, Government of Pakistan, Harappa Archaeological Research Project, Harappa.
- Parpola, A. 2005. Study of the Indus script, Paper presented at the 50<sup>th</sup> International Conference of Eastern Studies.
- Possehl, G.L. 2002. *The Indus Civilization: A Contemporary Perspective*, Rowman and Littlefield Publishers, Oxford.
- Possehl, G.L. and C.F. Herman. 1990. The Sorath Harappan: A new regional manifestation of the Indus Urban phase, in M. Taddei ed. *South Asian Archaeology, 1987*, Instituto Italiano per il Medio Estremo Oriente, Serie Orientale, Roma, pp: 295-320.
- Possehl, G.L. and M.H. Raval. 1989. *Harappan Civilization and Rojdi*, Oxford and IBH and the American Institute of Indian Studies, New Delhi.
- Shinde, V. 1998. Pre-Harappan Padri culture in Saurashtra- the recent discovery, *South Asian Studies* 14, pp:1-10.
- Shinde, V.S., Y. Yasuda, and G. Possehl, 2001. Climatic conditions and the rise and fall of Harappan Civilization of South Asia, *Monsoon and Civilization Conference Abstracts*, pp: 92-94
- Singh, G. 1971. The Indus Valley culture seen in the context of Post-Glacial climate and ecological studies in northwestern India, *Archaeology and Physical Anthropology in Oceania* 6(2), pp: 177-189.
- Singh, G., R.J. Wasson and D.P. Agrawal. 1990. Vegetational and seasonal climate changes since last full glacial in the Thar Desert, *Review of Palaeobotany and Palynology* 64, pp: 351-358.
- Sinha-Deshpande, S. and V. Shinde. 2005. Gujarat between 2000-1400 BCE, *South Asian Studies* 21, pp: 121-136.
- Smith, V.A. 1904. *The Early History of India*, Clarendon Press, Oxford.
- Sun, X.J., S.M. Yuan, J.L. Liu and L.Y. Tang. 1990. The vegetation history of mixed Koean Pine and Deciduous Forests in Changbai Mt. area, Jilin Province, Northeast China during the last 13000 Years, *Chinese Journal of Botany* 3(1), pp:46-61.
- von Rad, Ulrich, M. Schaaf, K.H. Michels, H. Schultz, W.H. Berger and Frank Sirocko. 1999. A 5000-yr record of climate change in varved sediments from the oxygen minimum zone off Pakistan, Northeastern Arabian Sea, *Quaternary Research* 51, pp: 39-53.
- Wei, K. and F. Gasse. 1999. Oxygen isotopes in lacustrine carbonates of West China revisited: implications for post glacial changes in summer monsoon circulation, *Quaternary Science Review* 18, pp: 1315-1334.
- Wheeler, R.E.M. 1968. *Indus Civilization* 3<sup>rd</sup> ed, supplementary volume to the Cambridge History of India, University Press, Cambridge.
- Yasuda, Y. 2001. The Changing pulse of Monsoon and the rise and fall of the ancient civilizations in Y. Yasuda and V. Shinde eds, *Monsoon and Civilization* (Abstracts), Roli Books, New Delhi.