

HAS SEA LEVEL FLUCTUATIONS MODULATED HUMAN SETTLEMENTS IN GULF OF KHAMBHAT (CAMBAY)?

World's major ancient civilizations flourished near river banks and deltaic sea coasts. The reason behind is the easy availability of water, a vital requirement of human beings. However, this choice of sites with easily available water has also cost dear to them. The change of river courses and sea level fluctuations led to the devastation of well-established civilizations. The drowning of ancient settlements due to raised sea level, forms the common subject matter of interest to marine archaeologists and marine geologists. While, marine archaeologists pay more attention to cultural aspects of those ancient people, marine geologists are interested in sea level fluctuations that cause the rise and fall of these civilizations. Marine archaeologists make use of artifacts, whereas marine geologists utilize the sediments and marine organisms to unravel the past. Since the common aim of both, the marine geologists working on palaeoclimate and the archaeologists is to illuminate the past, it becomes necessary to bring coherence between the two.

In the Indian context, some attempts were made to use the understanding of sea level fluctuations to explain the archaeological discoveries. Nigam et al. (1990) collected the evidences of sea level fluctuations from religious, archaeological records and successfully supplemented with inferences from the marine geological studies. Discovery of Lothal dockyard (first naval dockyard of the world as claimed by archaeologists) in Gujarat and drowning of Dwarka on the west coast and Pumpahar on the east coast of India are important examples of the role of the sea level fluctuations in shaping the history of mankind in this part of the world. The discovery of the Lothal dockyard, an important and famous name in Indian cultural heritage, provides evidence of ancient Indian interest in maritime activities around 4500 years B.P. (Rao, 1979). With the help of studies on foraminifera, the controversy over the rectangular structure at Lothal was settled in favour of the dockyard (Nigam, 1988).

In the same sequence, the recent discovery of Neolithic settlements in Gulf of Khambhat (Chengappa, 2002; Gupta, 2002) is really exciting and a milestone in the field of marine archaeology. As described by Gupta (2002) "the materials collected at the site include artifacts, possible construction elements with holes and studs, pot shreds, beads, fossil bones etc., which provide significant evidence of human activity in the area. A detailed examination of the area has

revealed riverine conglomerate at water depth of 30-40 m between 20 and 40 km west of Hazira near Surat (Gujarat)." Based on the radiocarbon dates of a wooden piece recovered from the site an age of 7500 BC is assigned to the human activities on the bank of river that was present at that time.

Because of its linkage to cultural heritage, this discovery has been hotly debated for its archaeological significance (Bavadam, 2002). However, the role of sea level fluctuations as cause for extinction of human settlements (if any) in this area is yet to get proper attention.

The above new findings get an additional support when viewed with reference to the inferred sea level fluctuations in this region. Hashimi et al. (1995, reprinted in 1999) published an updated sea level curve for the west coast of India. If the age of discovered settlement (Gupta, 2002) ~7500 BC [i.e. ~9500 Before Present (B.P.)] is plotted over this curve, it gives a water depth between 30 to 40 m (Fig.1). This exactly matches with the depth zone in which new findings are reported. Obviously, if the isobath of 40 m is considered as palaeoshoreline, the views of Prof. S.N. Rajaguru (*in Gupta, 2002*) comes true that "Bhavnagar and Hazira were probably connected at 7000 BC." This also implies that rivers (if any) must have been passing through the area (now under sea) before joining the sea of that time and thus supporting the postulation of Gupta (2002) – "Further, the acoustic images present channel like features indicating the presence of a river in the region."

Further observation of the curve (Fig.1) indicates that sea came to a stand-still at that level for some time, thus providing time for civilization to flourish before being engulfed by sea again. The remnants of this time, now discovered (Gupta, 2002) "push back the hitherto held view of the first human settlements from around 3500 BC (c.3500 BC – Valley of Sumer; c.3000 BC – Egypt and c. 2500 BC – Harappa) to 7500 BC, the making the present find the oldest known to man". The concordance between these two separately carried out studies once again points to the need for collaborative interdisciplinary studies to address the influence of sea level fluctuation on the rise and fall of ancient civilizations.

There is no doubt that the discovery of these very ancient Neolithic settlements in the Gulf of Cambay opens

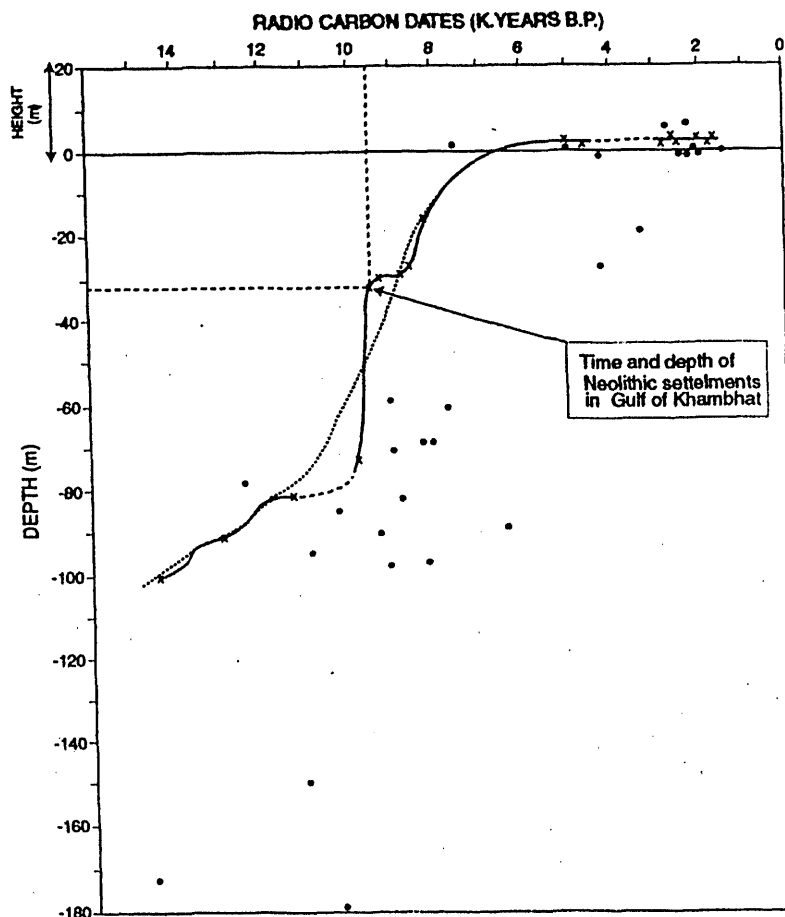


Fig.1. Holocene sea level curve for western Indian continental margin. Arrow showing the position of sea level ~9500 B.P. – the time for the Neolithic settlement in Gulf of Khambhat (modified after Hashimi et al. 1995).

up new challenges to marine archaeologists and marine geologists for sustained in-depth studies.

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References

- BAVADAM, L. (2002) Questionable claims. *Frontline*, March 5, pp.69-71.
- CHENGAPPA, R. (2002) The lost civilization. *India Today*, v.27, no.6, pp.38-46.
- GUPTA, H.K. (2002) Oldest Neolithic settlements discovered in Gulf of Cambay. *Jour. Geol. Soc. India*, v.59(3), pp.277-278.
- HASHIMI, N.H., NIGAM, R., NAIR, R.R. and RAJAGOPALAN, G. (1995) Holocene sea level curve and related climatic fluctuations for western Indian continental margin. An update. *Jour. Geol. Soc. India*, v.46, pp.157-162. Reprinted in "Vedic Saraswati: Evolutionary History of a Lost River of Northwestern India" B.P. Radhakrishna and S.S. Merh, (Eds.), *Mem. Geol. Soc. India*, no.42, pp.297-302.
- NIGAM, R. (1988) Was the large rectangular structure at Lothal (Harappan settlement) a "Dockyard" or an "Irrigation Tank"? *Proc. 1st Indian Conf. On Marine Archaeology of Indian Ocean Countries*, pp.20-22.
- NIGAM, R., HASHIMI, N.H. and PATHAK, M.C. (1990) Sea level fluctuations: Inferences from religious and archaeological records and their oceanographic evidences. *Jour. Mar. Archaeol.*, v.1, pp.16-18.