ABSTRACT

In this study, 434 sediment samples have been analyzed for benthic and planktic foraminifera as well as total organic carbon and stable isotope studies of carbon and oxygen from marine sediment cores SK-240/327, SK-243/I-1, and ABP-25/03, off Gujarat in the northeastern Arabian Sea. In total 249 species belonging to 103 genera of benthic foraminifera are reported in this study. For benthic foraminiferal faunal study, dry samples were sieved over 125 μm-size sieve and split into suitable aliquots to obtain ~300 specimens of benthic foraminifera, whereas for planktic foraminiferal study, samples were dry-sieved over 149μm-size sieve. My goal is to reconstruct the Holocene history of the Indian monsoon. Factor and cluster of analyses of thirty, thirty-four, and thirty highest-ranked benthic foraminiferal species identified each seven biofacies from three cores, characterizing major changes in shallow/deep-sea environments during the studied interval. The diversity parameters of benthic foraminifera like Information function [H(S)], Equitability (E), Number of species and Sanders' rarefied values were calculated to examine changes in the species diversity of benthic formaminifera driven by strong summer monsoon during the Holocene. The population flux of planktic foraminifer *Globigerina bulloides* suggests phases of strong summer monsoon during the early to mid-Holocene and a weak summer monsoon during the late Holocene. However, there seems to be a spatial variation in the strength of the summer monsoon in the northeastern Arabian Sea during the studied interval. For this study, the population percentage data of *Globigerina bulloides* and mixed layer species have been compared to the combined *Globigerina bulloides* percentages from ODP Hole 723A and core ABP-25/02, to understand intense upwelling driven by a strong summer monsoon changes as over the last 11 cal Kyr BP, from marine sediment records in both the eastern and western parts of the Arabian Sea. The northeastern Arabian Sea benthic foraminifera are good proxies to understand productivity changes related to monsoon variability during the Holocene. At core SK-240/327, a major change occurs at ~8.2 to 5.5 cal Kyr BP, suggesting strengthening of the summer monsoon, whereas in the late Holocene during 4 to 2 cal Kyr BP, the summer monsoon was weak. During the Medieval Warm Period the summer monsoon strengthened whereas during the most recent climatic event, the Little Ice Age (1400-1800 AD), there was a drastic reduction in the intensity of the summer monsoon. At core SK-243/1-1, a major change in benthic foraminifera suggests a major intensification of the southwest monsoon (SWM) monsoon ~11 to 7 cal Kyr BP,

coinciding with major intensification of the Indian summer monsoon. The summer monsoon was weak during ~7 to 2 cal Kyr BP. At core ABP-25/03, a major change in benthic foraminifera occurs during ~8.5 to 6 cal Kyr BP, indicating a stronger summer monsoon whereas during 4 to 2 cal Kyr BP the summer monsoon was weak. Thus it is observed from the study that the signature of southwest monsoon variability at the three different cores is not exactly similar. However all the three sites show strong southwest monsoon during early Holocene (upto ~6 cal Kyr BP), and weak southwest monsoon during late Holocene (from 4 to 2 cal Kyr BP).The eastern Arabian Sea upwelling induced productivity was higher during the early Holocene. The Total Organic Carbon (TOC wt. %) results document a great complexity when combined with *Globigerina bulloides* data at core ABP-25/03, a vital proxy for surface productivity. The carbon and oxygen isotope ($\delta^{13}C$ and $\delta^{18}O$) analysis of shells of benthic foraminifer *Cibicides* spp. has been used as an important tool in the reconstruction of the history of deep oceanic changes. The spectral analysis performed on *G. bulloides* and benthic foraminifera *Uvigerina proboscidea*, *Anomalina globulosa* and *Nonion* cf. *astarizans* shows cyclicity which can be linked to solar variability.

Keywords: Benthic and Planktic foraminifera, Indian monsoon, Upwelling, Oxygen Minimum Zone, Total organic carbon, Carbon and Oxygen isotope, Holocene, Cores SK- 240/327, SK-243/1-1 and ABP-25/03, Northeastern Arabian Sea.