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Special Issue

on

*Marine Micropaleontological Studies from the
Northern Indian Ocean*

Guest Editors

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Preface

The search for alternative source of both living and non-living resources, required by human-beings, has lead to the extensive exploration of the oceans in the modern days as well. Besides being the source of various living and non-living resources, oceans also form an important part of the global climatic system. Additionally, oceans are among the best archives of the past climatic changes. The excellent paleoclimatic archives in the oceanic sediments have been, and are being explored, as part of global efforts in the form of Ocean Drilling Program (ODP) and Deep-Sea Drilling Project (DSDP), as well as individual and joint efforts by different countries. The advantage of oceanic paleoclimatic archives lies in the availability of several proxies, which help in inter-comparison and evaluation of paleoclimatic inferences drawn from different proxies. The multi-proxy approach to the paleoclimatic studies helps in comparatively more precise reconstruction of past climatic changes. Out of various paleoclimatic proxies, those based on the microfossil characteristics, are most often used as microorganisms are very sensitive to even minor climatic changes and their response to climatic changes is many fold as compared to the changes in the non-living components. Additionally, the microfossils are available in plenty, in small sediment samples, and few of them have good preservation potential. Therefore, majority of the paleoclimatic studies from different parts of the world oceans, including the Indian Ocean, have been carried out by using the temporal changes in the microfossils' characteristics.

Indian Ocean is unique, being land-locked towards the northern margin, and experiences highest reported oceanic productivity. It is also the locale for the most severe oxygen depleted waters in the coastal and intermediate depth regions. Incidentally, a recent spurt in the oxygen depleted waters as well as productivity has been attributed to increased anthropogenic influence on the global climate. Detailed reconstruction of the paleoceanographic conditions over the past helps evaluate human influence in the climatic and oceanographic changes in the Indian Ocean region. For such studies also, characteristics of microfossils have been used very extensively.

The past climatic changes from the Indian Ocean region, as inferred on the basis of microfossil characteristics, have been compiled time and again. However, most of such papers have concentrated on a particular time period, and the results based on only single microfossil group have been discussed. Therefore, it was felt to bring together the paleoclimatic and paleoceanographic inferences from the Indian Ocean region, carried out so far, based on different microfossil groups. This special issue of *Indian Journal of Marine Sciences* [IJMS] is an effort in this direction. Fourteen papers have been included in this issue. The papers cover paleoclimatic/paleoceanographic inferences drawn from the diverse microfossil groups, including, foraminifera, radiolarian, pteropods, spores-pollens, ostracodes, etc. The objective is to provide a comprehensive review of the developments in the micropaleontological studies through ages, with examples from the northern Indian Ocean region.

Micropaleontological studies have experienced a sea-drift over the years. *Srinivasan* has documented the development of marine micropaleontology from the initial days wherein morphological studies were the trend, to the recent application of molecular systematic analysis to understand evolutionary history of the foraminifera and to differentiate cryptic species. Prior to starting micropaleontological investigations in an area, it is useful to have information of the micropaleontological studies carried out in the area. *Bhalla et al.* and *Khare et al.* have reviewed foraminiferal studies carried out from the coastal, near-shore and shallow waters of both the western

and eastern margin of India, respectively. *Saraswati* has discussed the importance of symbiont bearing larger foraminifera of the Lakshadweep region, to assess the health of coral reef as well as to reconstruct temporal changes in the physico-chemical characteristics of the coral reef environment. Laboratory culture studies help evaluate the field based foraminiferal proxies for paleoclimatic/paleoceanographic reconstruction. The paper by *Linshy et al.* provides the comprehensive details of the laboratory culture studies on benthic foraminifera carried out with the aim to refine field based foraminiferal proxies for paleoclimatic/paleoceanographic reconstruction. The monsoon induced upwelling is one of the various factors that affect foraminifera, and past changes in the monsoon intensity have been reconstructed based on the changes in foraminiferal characteristics. *Naidu* has discussed the effect of monsoon induced upwelling on the abundance, size, carbon isotopic composition and coiling direction of selected planktic foraminifer species. *Bhaumik et al.* have reconstructed oceanographic changes in the northern Indian Ocean during the Miocene, from the benthic foraminifera of the DSDP Hole 216A. The applicability of foraminiferal characteristics to understand temporal changes in the seawater circulation is further discussed by *Sinha & Singh*, who provide a detailed account of the circulation changes in the northern Indian Ocean during the last 5 Ma. *Sanjay et al.* discuss the utility of foraminifera to understand past sea-level variations and reconstruct the sea-level changes between ~9000 to ~14000 years B.P., along the central east coast of India.

Though out of various microfossils available in the Indian Ocean sediments, foraminifera have received maximum attention, other microfossil groups have also been studied and used to understand the past climatic and oceanographic changes. *Sharma* have reviewed the climatic and oceanographic changes during the Neogene period, based on the changes in the radiolaria. The distribution and paleoclimatic implications of another microfossil group, namely, ostracod has been discussed by *Hussain et al.* *Singh* has adopted a multi-proxy approach to understand the changes in the monsoon intensity and oxygen minimum zone, in the Arabian Sea during the last ~30000 yr B.P. *Singh* propose a close link between productivity, OMZ intensity and aragonite compensation depth. *Panchang et al.* provide an overview of pteropod studies carried out from the Indian Ocean region along with new information about the distribution of pteropods along the Myanmar shelf. *Prasad et al.* have carried out palynological analysis of the sediments recovered from the region off central west coast off India, to understand the processes controlling the origin, preservation and degradation of organic matter in this region.

Though, this special issue of *IJMS* is a compilation of only a part of the large number of micropaleontological studies carried out from the northern Indian Ocean region, we believe that this special issue will be useful for the micropaleontologists, as well as the workers interested in paleoclimatic/paleoceanographic studies from the Indian Ocean.

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