**Book Review**


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The Indian Ocean has a profound influence on the lives of the people who live along its shores: fishermen, sailors and merchants travelled its water linking the world’s earliest civilisations from Africa to E. Asia in a complex web of relationships. Trade underpinned these relationships, but the ocean was also a highway for the exchange of religious cultures and technologies giving the Indian Ocean region an identity as a largely self-contained world. This region comprises an enormous variety of physical settings for all forms of life. One particular meteorological event, however, binds many of the lands around the Indian Ocean into a distinctive environment: the Monsoons, which set the basic rhythms for life across much of the tropical and equatorial Asia and sustain a spectrum of climates, plant and animal life.

In this volume, the second of a series, the author, in his inimitable style, collates and vividly presents the 'images and realities' concerning the existing information on the Indian Ocean. The matter, carefully selected and ably presented has great relevance to the developing countries bordering the Indian Ocean as a new frontier for food and wealth. In sixteen well-balanced chapters, the author, using the scattered information, published by the best specialists available on the concerned subjects, has endeavoured to build up fascinating 'stories' on important basic and applied aspects of the Indian Ocean.

Coastal oceanography, has been covered quite extensively being a blend of several disciplines that are focused on the shore. The shore is treated as a field laboratory where one can directly observe nature and study the forces that shaped the coast. This edge of the sea is a strange and beautiful place. All through the long history of Earth, it has been an area of unrest where waves have broken heavily against the land, where the tides have pressed forwards over the continents, receded and then returned. Not only do the tides advance and retreat in their eternal rhythms, but the level of the sea itself is never at rest. Excellent descriptive accounts are furnished on the sandy beaches of the East and West coasts of India and those of the atolls of the Lakshadweep, and Mombasa, Kenya, as basic foundations for further work as possible sites for the development of tourism and other activities.

The nature and problem associated with coastal erosion, a topic of great practical importance, is explained in chapter ten and the author suggests the need for the development of an action plan for the effective protection and conservation of the densely populated coastal zone.

In discussing the benthic communities, the author explains the nature, incidence and adaptations of the fauna of this biotope. The types of benthic organisms are described such as the littoral and abyssal, microfauna and flora, the curious meiofauna that spend their lives within the interstitial spaces of mud and sand, the macrofauna, the epifauna and infauna including the estuarine benthos. The near shore benthic community with its associated sunlight, wave activity and changing environment conditions is quite different from those further out to the sea over the shelf, slope and the more protected deep sea. The benthos reflects the productivity of the surface waters. The author has carefully chosen representative samples of the different types of benthos of the Indian seas representing the initial effort in presenting the interesting aspects of this habitat for the benefit of students and the laymen.

For those interested in the nutrient cycles in the oceans, a comprehensive chapter is devoted on the important role of nutrients indicating the several unusual and unique aspects of the biogeochemistry of the north-western Indian Ocean. The nitrogen cycle in the Arabian Sea is so rich particularly during the upwelling periods of the south-west monsoon that it results in zooplankton blooms and consequently high fisheries productivity. The importance of this phenomenon is highlighted pointing out the gaps in our information.

Like on land, the sea has a variety of microorganisms such as bacteria, viruses, protists and fungi, each performing a specific function. Thus, the autotrophic bacteria product carbohydrates and proteins, others derive energy by oxidation of inorganic compounds.
such as hydrogen sulphide or ammonia, some are photosynthetic, while others are chemotrophs deriving their energy from chemical reactions. Heterotrophic bacteria obtain their energy by oxidation of organic compounds and perpetuate by mineralising organic matter. Using this ability to survive under a variety of changing conditions, they perform amazingly different functions such as the degradation of pesticides, hydrocarbons and petroleum, recycle nitrogen, sulphates and phosphates, emit bioluminescence, concentrate toxic heavy metals such as mercury and may in turn be concentrated in filter feeders and enter through the food web from fish to man.

Fungal parasites infect diatoms, algae, sea grasses, bivalves and corals. Thus, the marine environment is highly dynamic both in its photosynthetic inputs and heterotrophic breakdowns which are closely linked.

Over the years, there has been great interest and much research directed to the problem of biofouling in the tropical seas of India. Biofouling affects all marine operations, whether it be shipping, offshore oil mining, coastal power generation, marine electronics, mariculture, waterfront installations or naval operations. Even moving parts of vessels are affected as are their operating speeds and fuel consumption. The problems encountered are numerous reflecting the number of species involved. Fouling related costs involved are indeed staggering more especially in the warm tropical waters which provide excellent support for the development, growth and survival of its varied marine life. The material presented in this book will help to augment what is already known as well as provide new information on the composition of the fouling community, the nature of the primary slime and the succession of fouling organisms including, microfouling, role of diatoms, larval attachment, metamorphosis and growth leading to climax associations, antifouling compounds and a variety of control methods. Biofouling still continues to be a serious problem and provides one of the greatest challenges to scientists yet to be overcome since every fouling control method how so ever innovative and ingenious, it may appear at first, has found only a limited use when tried for longer period in natural sea conditions and under different geographical latitudes.

Useful biotechnological information available on cytogenetic studies of marine animals of Indian waters such as copepods, shrimps, barnacles, mussels and oysters are included, indicating its importance in the genetic improvement programmes in aquaculture.

Further, electrophoretic studies of proteins and enzymes are providing genetic markers to confirm the taxonomic validity of many animals which cannot be easily resolved by conventional methods.

Engineering problems and oceanographic instrumentation, especially those indigenously developed for use onboard research vessels as well as coastal laboratories, both vital to the study and utilisation of the ocean resources have been addressed adequately to satisfy the needs of the inquiring mind. Ocean survey technology involving problems related to erosion, ports and harbours, control or coastal pollution, energy utilisation and equipment for ocean engineering application such as wave and tide measurements, current meters, measurement of meteorological parameters, mooring designs, installation techniques etc. are all lucidly explained avoiding jargon. These information would be of special interest for the students of biological oceanography.

The biomedical properties of the horse-shoe crab (Limulus) two species of which occur in India are explained in detail after presenting a detailed account of its occurrence, morphology and biology. The famous Limulus Amebocyte Lysate (LAL) is used as a tester in pharmaceutical, and helps in the detection and treatment among others of endotoxins, urinary and eye infections, bacterial meningitis and gonorrhoea. Similarly one chapter is devoted for the brine shrimp Artemia whose nauplii larva serves as an excellent, favourite, live feed in aquaculture industry.

At par with developments in other scientific disciplines, information technology in marine science has also become an unavoidable professional activity through collection, storage and retrieval of information. This rapid information management is facilitated by digital storage technology, software and communication channels. Marine science information based in India is now strong enough for the needs of the user community to maximise the use of available resources.

The author with his wide acknowledge, unique and multifaceted achievements and leadership in the subject proposes useful suggestions to update teaching and training programmes in Marine Science such as organising refresher courses, revision of syllabi, use of modern equipments, adequate financial support, liberal use of computers, emphasis on biotechnology, remote sensing and satellite imagery, intercalibration exercises and teaching of marine biology even at undergraduate level etc.
The last chapter is devoted for the sunken treasures, that deals with marine archaeology in India. The importance of exploring and preserving the underwater cultural heritage of India which occupies a strategic position in the Indian Ocean was realised in 1981 and a Marine Archaeology Centre (MAC) was established in the NIO in Goa, and through the continued cooperation of scientists belonging to different disciplines of marine science, since its inception, is contributing towards the development of this fascinating subject meaningful and rewarding.

Covering more than seventy per cent of the globe's surface, the oceans make our planet truly unique, yet, it is only within the last 50 years that international oceanographic research has fully disclosed how fundamentally important the oceans are to all of us.

This book brings the extraordinary results of Indian research to the teachers, students and the general public especially to those who look upon the oceans with wonder and respect.

I recommend this book strongly for all those interested in the oceans.

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